Encore Multi-port DSU/CSU User Guide

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Digital Link

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Products Manufactured Under
An ISO 9001 Certified
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To maintain EMC Class B (CE Label) compliance, shielded cables should be used with the unit.

This product complies with

- CE MARK
- FCC Part 15 Class A
- U.L. 1950
- VL1459
- C.U.L. CSA 950

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Preface

The Multi-port Encore DSU/CSU User Guide provides the information to install, test, operate and manage Digital Link VX Encore™, DL100 Encore™ and DL1200/2400™ DSU/CSUs (DSU/CSU or unit in this guide).

Audience

This guide is intended for network managers and technicians experienced in installing LAN to WAN equipment. Users should be thoroughly familiar with the network topology within which the DSU/CSU operates.

Symbols

Symbols alert you to instructions that could result in equipment damage, or injury to you.

The symbols this guide uses are:

NOTE: Important information relating to the previous paragraph.

CAUTION: If you do not follow the instructions in the previous paragraph, you might damage the equipment or application.

WARNING: If you do not follow the instructions in the previous paragraph, you might injure yourself.

Electro-Static Discharge — CAUTION: If you do not follow the instructions in the previous paragraph, you may discharge static electricity into the equipment and, thereby, damage it.

Typographic Conventions

Typographical conventions are used throughout this document. Their purpose is to help you distinguish between the different types of information and instructions contained in the document. We hope you find it helpful.

Table 0-1

Typeface or Symbol	Meaning	Example
`Courier Font AaBbCc123`	The names of commands, files, and directories, as well as on-screen computer output.	Edit your `.login` file. Use `ls -a` to list all files. `machine_name% You have mail.`
Courier Font, Bold AaBbCc123	User-typed input, contrasted with on-screen computer output.	`machine_name%` **`su`**
Courier Font, Bold AaBbCc123	User keystrokes	User keystrokes such as **Ctrl-L**.
Palatino Font, Italic AaBbCc123	Command-line placeholder: replace with a real name or value.	To delete a file, type **rm** *filename*
Palatino Font, Italic AaBbCc123	Book titles, new words or terms, or words that need to be emphasized.	Read Chapter 6 in *User's Guide*. These are called *class* options. You *must* be root to do this.

When Viewing in Adobe Acrobat™

If you use Adobe Acrobat™ to view this documentation, you should be aware of the following helpful navigation hints within the document.

Generally, anything that is this color blue is a *HyperText Link*.

A HyperText Link connect parts of a document, or lets you jump to other PDF (Acrobat) documents.

To follow a link:

1. **Move the pointer over a linked area. The pointer changes to a pointing finger when positioned over a link.**
2. **Click to follow the link.**

   You will be moved in the document to a place that corresponds to the *HyperText* link you clicked on.

To retrace your viewing path:

Click the Go Back button or choose View > Go Back to return to the previous page, document, or magnification level.

Examples

For example, if you click on the following reference to *Typographic Conventions* on page -xxv, you will be transported to the beginning of this section.

Another very useful example of a HyperText Link is a page number in the Table of Contents or Index.

Digital Link Technical Support

If you have a problem, prepare the following information and contact Digital Link Technical Support:

- DSU/CSU configuration?
- Software revision?
- Hardware revision?
- When was the DSU/CSU configuration last changed? How?
- What connects to the DSU/CSU (routers, test equipment, etc.)?
- What operation was in progress when the failure occurred?
- What was the state of the LEDs on the front panel?
- Are the cables attached securely to the DSU/CSU?
- Are the cables shielded?
- What is the DSU/CSU's clock source?
- What are the DSU/CSU's passwords? (Please provide the passwords or reset them before returning the DSU/CSU for repair.)
- What information is on the configuration, error statistics and event history screens at the time of the error? Please provide a hard copy capture of the screens.
- What methods did you use in trying to resolve the problem?
- Is the problem repeatable? If so, how?
- Who can be contacted to discuss the problem?

Telephone:	**(408) 745-4200**
Facsimile:	**(408) 745-6250**
Email:	**support@dl.com**
Internet:	**www.dl.com**
24-Hour Service, 7 Days a Week	

Returning a DSU/CSU

In the event that you need to return a DSU/CSU for service or repair, please call the Customer Service Dept. at Digital Link, (408) 745-4200 and obtain an **ERA** (Equipment Return Authorization) number.

Package the DSU/CSU carefully placing the ERA number on the address label and a note inside describing the problem and send it to the address below.

Customer Service Department

DIGITAL LINK CORPORATION

217 Humboldt Court

Sunnyvale, California 94089

Send Us Your Comments

We'd like to know if this manual meets your needs.

If you send us your comments, we can improve our service. Tell us what parts of the manual work for you, what parts did not, and what was missing.

Introduction 1

Digital Link offers four Multi-port Encore DSU/CSUs which enable you to access high-speed public/private T1/FT1 and frame relay services. The DSU/CSUs convert V.35, EIA-530 and RS-449 compatible DTE data for T1/FT1 network transport.

The four DSU/CSUs are the VX Encore, DL100 Encore and two Digital Service Hubs. The products shown in Table 1-1 differ only in the number of data ports they offer.

Table 1-1 Data Ports

Multi-port Encore DSU/CSUs	Number of Data Ports
VX Encore	2
DL100 Encore	2, 4, or 6
Two Digital Service Hubs[1]	12 or 24

1. A Digital Service Hub with 12 data ports is also called a DL1200, with 24 data ports—DL2400.

Figure 1-1, Figure 1-2, and Figure 1-3 show drawings of the VX Encore, DL100 Encore and a Digital Service Hub, respectively.

An additional standard feature, with the exception of the VX Encore, is a DS1 Drop-and-Insert port for data and voice, called the auxiliary port. On the VX Encore, the AUX port is an optional feature.

The four DSU/CSUs combine the functionality of data multiplexers, DSU/CSUs and transmission monitoring and test equipment. They are ideally suited for frame relay.

When referring to the four Multi-port DSU/CSUs, this guide uses DSU/CSU. When information applies to only one of the four, the DSU/CSU is identified by name.

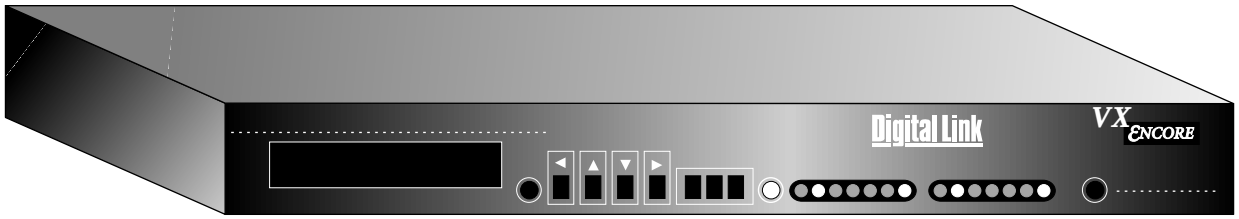

Figure 1-1 VX Encore

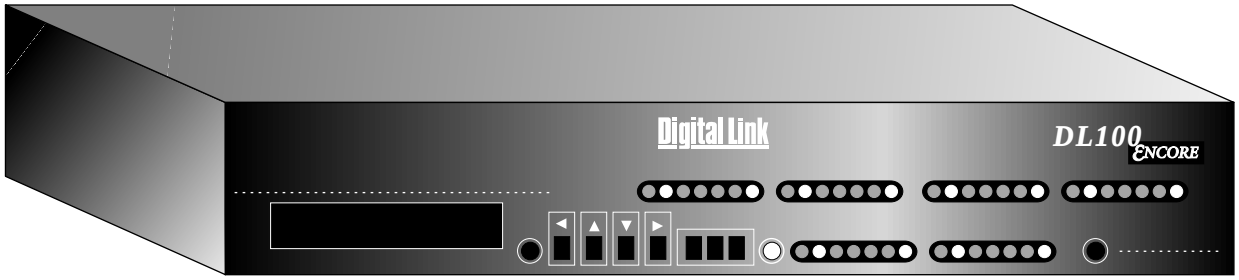

Figure 1-2 DL100 Encore

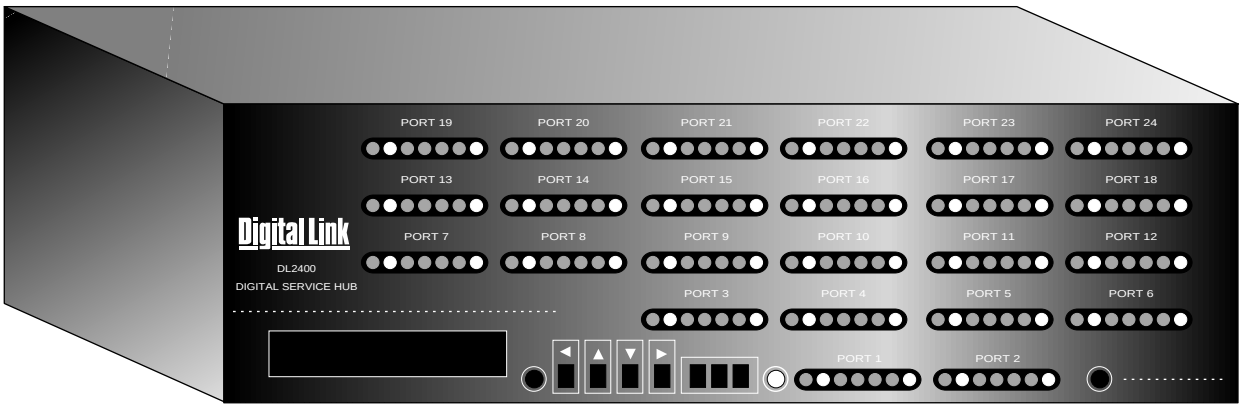

Figure 1-3 Digital Service Hub

Multi-port Encore DSU/CSU Features

The four Multi-port Encore DSU/CSUs offer these features.

Service

- T1/FT1 point-to-point connectivity.
- Access to packet-based services such as frame relay.
- Full FDL communications with the remote DSU/CSU (ESF mode only).
- D4 or ESF framing and AMI or B8ZS T1 line encoding schemes.
- Guaranteed pulse density with inverted HDLC formatted data or forced mode transmission.
- V.35/RS449 multiple data inputs multiplexed onto T1 or Fractional T1 network.

Data ports

- Software configuration for V.35, RS-449 or EIA-530 electrical interface with a DB-25 connector.
- A DTE or DCE interface.
- Bandwidth mapping into contiguous, alternate or manually selected DS0 slots.
- Selectable data rates—from 56Kbps to 1.536Mbps.
- A smooth clock at all data rates.
- Timing options—SCTE, SCT and inverted SCT clock.
- Standard DS1 drop and insert port with the DL100 Encore, DL1200 and DL2400; aux. port is optional on the VX Encore. The port is designed for connections to DS0 channelized customer premise devices such as channel banks and PBXs.

Access/Management Features

- Access for a terminal, Telnet connection, modem, and SNMP management station or DLMS.
- Front panel and terminal interface configuration and management capability.
- An embedded SNMP agent.
- An integrated CSU for monitoring the T1 link for network integrity.
- Centralized management of DSU/CSUs connected on a single RS-232 multi-drop.
- Support for SNMP RFC 1406 (for T1), MIB II (RFC 1213) and Enterprise MIBs.
- Front panel LEDs and test jacks.
- Front panel with a fluorescent 16-character front panel display and four keys.
- Performance monitoring and built-in test patterns and diagnostic tools to help maintain the line and troubleshoot problems.
- Multiple payload loopback tests.
- Alarm reporting (including external alarms) to a terminal, printer or dialed-out.

Compliancy

Compliance with: FCC Part 68, AT&T TR62411, AT&T TR54016-1989, ANSI T1.403-1989, FCC Part 15, UL 1459, UL 1950, DOC (IC), CUL (CSA) and AT&T TR54019 Fractional T1

About the Telnet Utility

Telnet is a TCP/IP-based network application or Internet service that enables you to log on to another node on the network and use the node's interface as though you were directly connected to the node. The Telnet application uses TCP as the transport protocol.

To log on a remote node using Telnet, you simply enter the telnet command followed by the node's IP address or domain name or you use an application that executes the command.

Example of a Network Configuration

Figure 1-4 on the following page shows an example of a Wide Area Network with two VX Encores and one DL100 Encore.

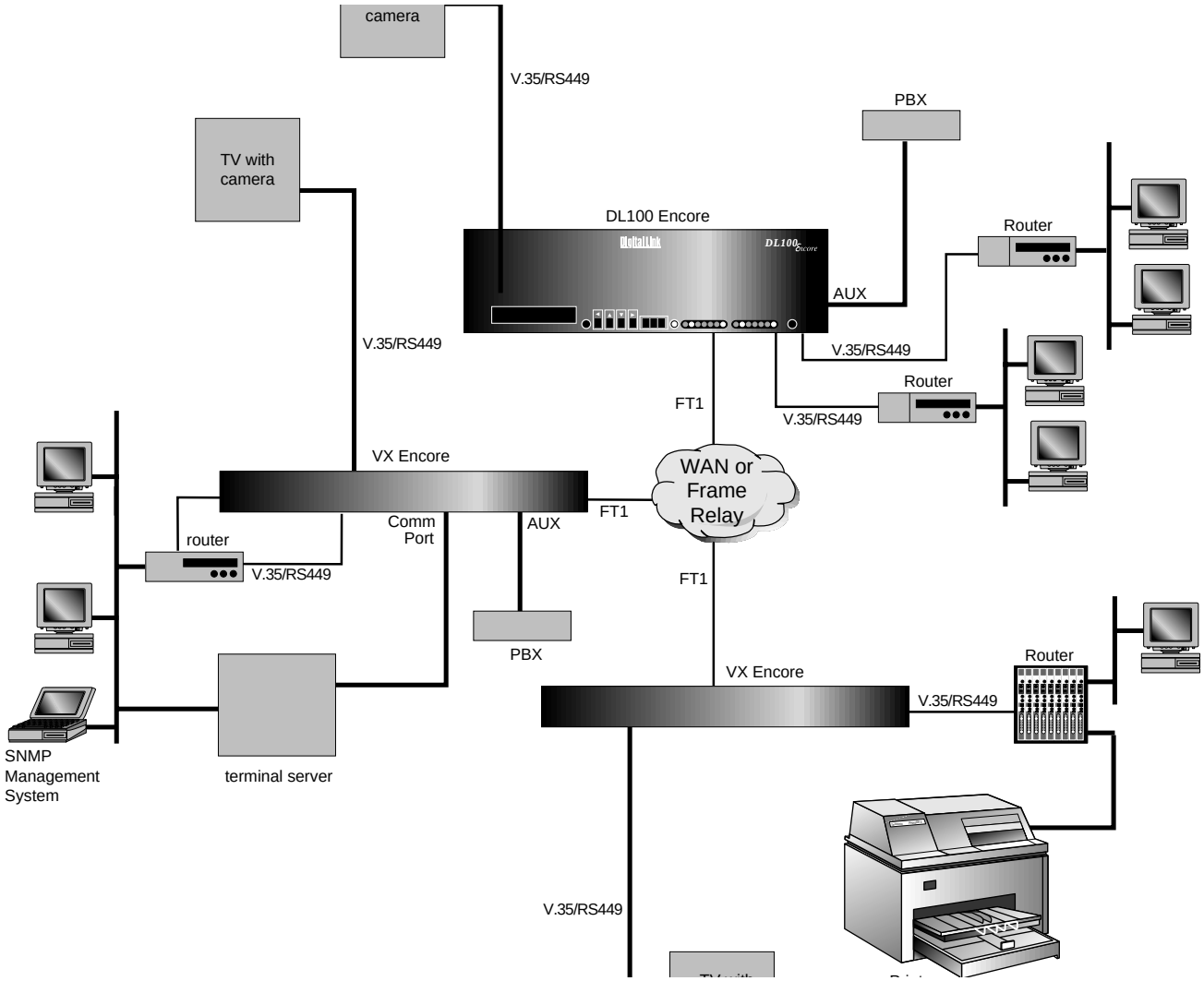

Figure 1-4 Example of Wide Area Network

Installation 2

This chapter describes the physical installation process.

The installation is the same for each Multi-port Encore DSU/CSU. When information applies to one DSU/CSU only, the DSU/CSU is specifically identified.

Preparation

Before you can install the Multi-port Encore DSU/CSU, you need to:

- Unpack and inspect the DSU/CSU for damage that may have occurred during shipment. Wipe the exterior with a soft cloth, if needed.
- Check the equipment provided with the DSU/CSU—mounting ears attached to the DSU/CSU for rack mounting, an AC power cord and wall mount AC adaptor with the VX Encore.
- Save all enclosed packing slips and documents. Save shipping cartons and packing materials until the DSU/CSU is installed and its operation verified.
- Prepare the location and the equipment as described below.
- Fill out and mail the registration card.

Required Location

Install the DSU/CSU in a Restricted Access Area in accordance with safety regulation in Articles 110-16, 110-17, and 110-18 of the National Electric Code, ANSI/NFPA 70. An example of a suitable area us a dedicated equipment room or closet that is clean, well-ventilated and free of environmental extremes. Allow two to three feet of clearance around the DSU/CSU to give you access during the installation.

WARNING: Hazardous voltages in the form of simplex power may exist at the telephone company's interface. These voltages are hazardous and can cause death or severe injury!

Do not proceed with this installation if voltage is present between the transmit and receive pairs of the network interface. You can ask the serving telephone company to temporarily disconnect the simplex power for the installation. This is recommended for your personal safety.

Check the Equipment

Make sure you have the following equipment ready for the installation:

- One of the following:
    - Comm port cable
      RS-232 straight ribbon cable with a DC-9 male connector on one end for connecting a terminal, modem or SNMP workstation.
    - Multi-drop cable with DC-9 connectors for connecting DSU/CSUs in a daisy chain. DC-9 to DB-25 adaptor and a null-modem adaptor.
- Data port interface cable

  The DTE or DCE type cable has a DB-25 male connector on one end and a V.35 or RS-449 connector on the other end.
- Network port interface cable

  Network cable can have DA-15 male connectors on both ends or a DA-15 male connector on one end and an RJ-48C connector on the other end.

- AUX port interface cable

  The cable can have DA-15 male connectors on both ends or a DA-15 male connector on one end and an RJ-48C male connector on the PBX end.

- AC power cord and wall mount -48 VDC adaptor (VX Encore only).

- Tray cable

  The cable connects the DSU/CSU to DC power, and must be a UL recognized 14 AWG, 3 conductors, copper strand wire, electrical power and control tray cable, type TC: tray cable, 600 V 90 degree C. An Alpha Wire Company No. 45443 is an example of a proper DC power cable.

- Equipment grounding cable

  This cable connects the DSU/CSU to earth ground.

- ANSI terminal

  Use the ANSI-based VT100-compatible terminal to configure the DSU/CSU.

Equipment Model Numbers

The Digital Link model numbers are listed in Table A-14 on page A-12. Cable and connector pin-out assignments are listed in Appendix B, *Connector Pin Assignments*.

Preparing the Required Information

To establish a Telnet connection to a Multi-port Encore DSU/CSU from a remote terminal and to use SNMP network management, you must specify the DSU/CSU IP address and IP subnet mask.

In addition, for SNMP network management, you need one to three Network Management Station (NMS) IP addresses (refer to *Configuring for SNMP* on page 3-28.

Have the work order from service provider containing framing and line code requirements available.

2

Installation

The Multi-port Encore DSU/CSU installs on a flat surface or mount in a 19" or 23" rack.

Flat Surface Installation

To install a DSU/CSU on a flat surface:

1. **Remove the ears attached to the DSU/CSU.**
2. **Remove the covering from the stick-on rubber feet and stick the feet to the bottom of the DSU/CSU.**
3. **Place the DSU/CSU on a flat, stable surface.**

   You can stack other units on top of the DSU/CSU.

Rack Mount

The DSU/CSU can mount on a 19″ or 23″ rack.

To mount a DSU/CSU on a rack:

Attach the DSU/CSU's ears to the 19" rack, as shown in Figure 2-1 (or in a 23″ rack as shown in Figure 2-2 on page 2-5).

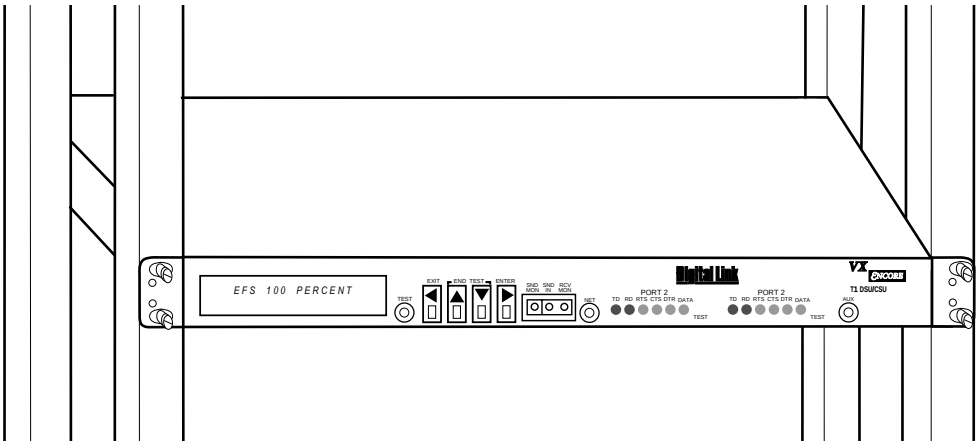

Figure 2-1 VX Encore Mounted on a 19" Rack

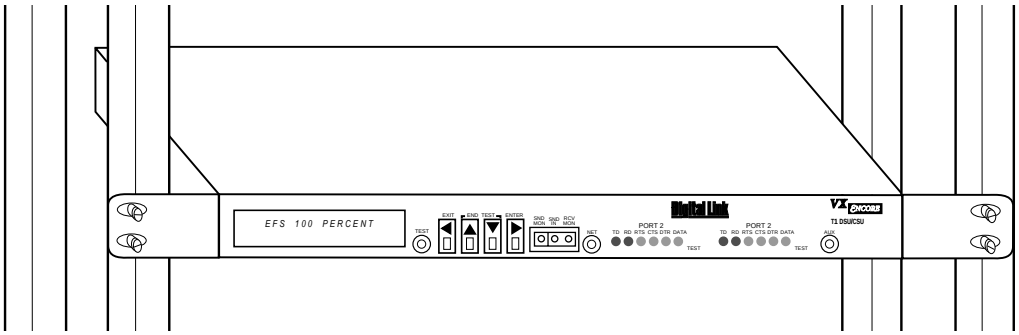

Figure 2-2 VX Encore Mounted on a 23" Rack

Connecting the DL100 to AC Power

The DL100 Encore DSU/CSU and the two Digital Service Hubs (DL1200 and DL2400) use AC power only. (To install the VX Encore to AC power using an adaptor go to *Connecting the VX Encore to AC and DC Power* on page 2-8.)

The DSU/CSU should be within six feet of a grounded AC outlet that is controlled by a circuit breaker and capable of furnishing 120 VAC, 275mA at 60 Hz (for VX Encore), 120 VAC, 0.5A at 60 Hz (for DL100 Encore, DL1200 and DL2400).

To connect the DSU/CSU to AC power:

1. **Insert the AC power cable into the AC power receptacle on the rear panel see** Figure 2-3**). Connect the other end to the AC outlet.**

   The TEST LED on the front panel flashes as the DSU/CSU automatically runs the Self Test at power up.

   When the test successfully completes, RUNNING SELF TEST and SELF TEST PASSED appears on the front panel display. If the test fails, the TEST LED turns red for 10 seconds and then green.

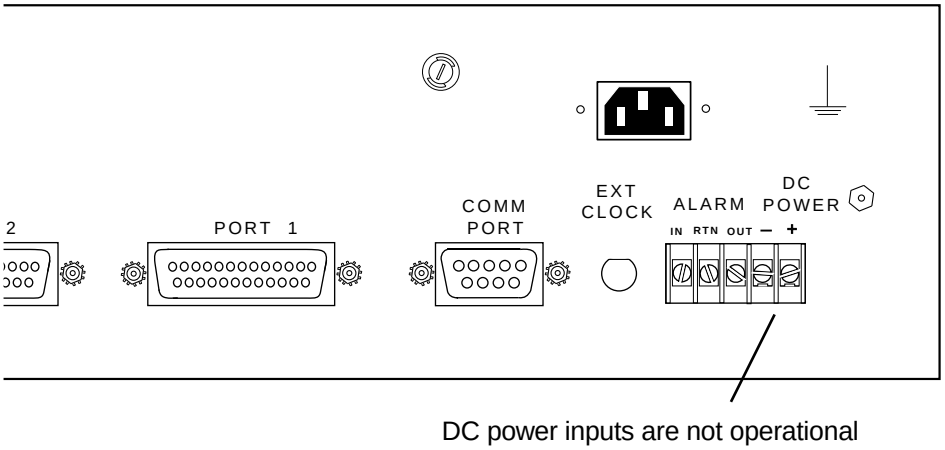

Figure 2-3 AC Power Receptacle on DL100 Encore and Digital Service Hubs

Connecting the VX Encore to AC and DC Power

This section describes:

- AC power connection
- DC power connection

Connecting the VX Encore to AC Power

To connect the VX Encore to AC power, you need the -48VDC adaptor provided with the DSU/CSU.

1. **Before you connect the VX Encore to the centralized DC power source, strip 2" of jacket material off the tray cable and 1/2" of insulation off each wire.**
2. **Connect the positive wire to the positive terminal and the negative wire to the negative terminal. See** Figure 2-4**.**
3. **Plug the adaptor into an AC outlet.**

   The TEST LED on the front panel flashes as the VX Encore automatically runs the Self Test at power up.

   When the test successfully completes, the front panel display shows RUNNING SELF TEST and SELF TEST PASSED.

   If the test fails, the TEST LED turns red for 10 seconds and then green.

.

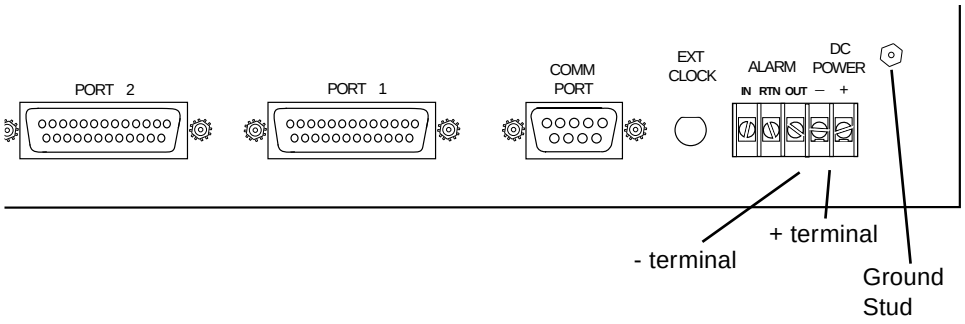

Figure 2-4 Plus and Minus Terminals on VX Encore Back Panel

Connecting the VX Encore to DC Power

You need a tray cable that is UL recognized 14 AWG, 3 conductors, copper strand wire, electrical power and control cable, type TC: tray cable, 600 V 90 degree C. An Alpha Wire Company No. 45443. is an example of a suitable cable.

WARNING: Observe caution when you connect the VX Encore to DC power. If you connect it improperly, you may damage the DSU/CSU and/or harm yourself.

To connect the VX Encore to DC power:

1. **Make sure the DC power is off.**
2. **Strip 2" of jacket material off the cable and 1/2" of insulation off each wire.**
3. **Connect the _48V wire to the negative terminal using a small flat-blade screw driver to fasten the wire. See Figure 2-5.**
4. **Connect the ground wire to the positive terminal the same way.**
5. **The DSU/CSU is designed to operate with negative voltage, therefore, the positive terminal is connected to ground.**

6. **Connect a third safety ground wire to the ground stud using a 1/4" wrench and a 5 Lb-ins fastening torque and to a good ground.**

7. **To minimize disturbance to the wires through casual contact, secure the tray cable near the rack frame using multiple cable ties. Use at least four cable ties, a minimum of 4 inches apart, tying the first tie within 6" of the terminal block (a cable tie mount is provided).**

8. **Connect the VX Encore to the DC power source.**

The TEST LED on the front panel flashes as the DSU/CSU automatically runs the Self Test at power up. When the test is successfully completed, RUNNING SELF TEST and SELF TEST PASSED appears on the front panel display. (If the test fails, TEST LED turns red for 10 seconds and then green.)

Grounding

Once you connect the DSU/CSU to the network, you must connect an earth ground cable to the ground stud on the back panel. (Refer to *Equipment Grounding Conductor* on page A-10.)

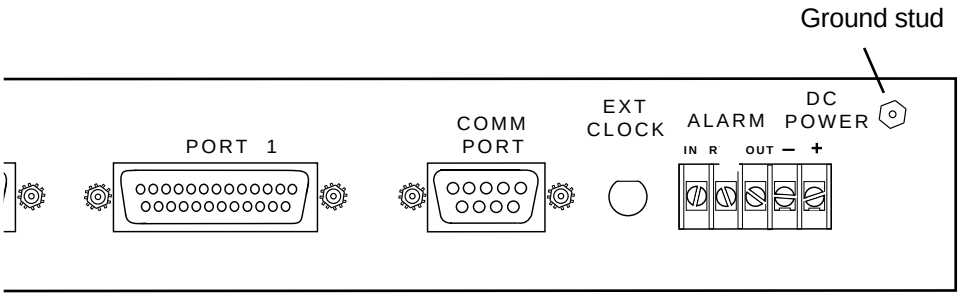

Figure 2-5 Back Panel Ground Stud

Connecting to the DTE Devices

Once you have configured the DSU/CSU, you are ready to connect it to the DTE devices, the ancillary equipment (if using the optional AUX port) and to the network.

To connect the DSU/CSU to the DTE devices, you use a data port interface cable. The cable type depends on the DSU/CSU's interface (V.35 or RS-449) and its operating mode (DCE or DTE). Table 2-1 lists the cable and distance requirements.

Table 2-1 Connecting the DTE cable

DSC/CSU	Cable
In DCE mode	Use a DTE cable. For most applications, the customer equipment operates as a DTE. Set the DSU/CSU operating mode as DCE.
In DTE mode	Use a DCE cable. In some instances, as in tail circuit applications, the customer equipment operates as a DCE. For these applications, set the operating mode as DTE. See "MODE" and "FORMAT" <cell>on page 3-22.
V.35 interface	Use the cable's V.35 connector to connect to the DTE device and the DB-25 connector to connect to the DSU/CSU.
RS-449 interface	Use the cable's RS-449 connector to connect to the DTE device and the DB-25 connector to connect to the DSU/CSU.
Distance	Maximum distance between the terminal and DSU/CSU—50 ft.

NOTE: For EIA 530 or X.21 applications, use an EIA 530 or X.21 cable and set the format to RS-449.

Fireberd Compatibility and V.35 Cable

If you're using a DTE cable not supplied by Digital Link when connecting a Fireberd test set to a DSU/CSU configured for V.35, make sure the following pins are not connected on the cable's V.35 end:

- BB, Z, EE, CC

These pins are reserved for special functions in the Fireberd test set.

To connect the DSU/CSU to the DTE devices:

1. **Using the appropriate DTE cable, connect the cable to the DB-25 female port on the DSU/CSU, labeled PORT 1, and to the V.35 or RS-449 port on the first DTE device.**

2. **Using the appropriate DTE cable, connect the cable to the DB-25 female port on the DSU/CSU, labeled PORT 2, and to the V.35 or RS-449 port on the second DTE device.**

   Use this method to connect the DSU/CSU to the other DTE devices.

Connecting the AUX Port to Ancillary Equipment

When you connect the ancillary equipment or the PBX to the AUX port, you may need to increase the distance between the DSU/CSU and the DS1 cross connect (patch panel) or the DS1 device (by setting the line equalization in Equalization in Menu-4 Main Configuration (refer to *Configuring the Menu-4 Main Parameters* on page 3-11).

To connect the ancillary equipment to the AUX port:

1. **Using the cable from Digital Link with a female DA-15 connector, connect the cable to the AUX port, labeled AUX, and to the ancillary equipment or PBX.**

Connecting to the T1 Network

Before you connect a Multi-port Encore DSU/CSU to the T1 network, make sure you are using the correct cable and have determined the correct distance between the DSU/CSU and the T1 cable.

About the Cabling

Use a North American standard T1 cable, a twisted-pair cable with 100 ohm impedance, commonly referred to as T-Screen or ABAM (or its equivalent) to connect a T1 cable to the DSU/CSU. Digital Link has designed the DSU/CSUs to operate with this cable.

The T1 cable's send and receive pairs are shielded separately to minimize cross-talk. Additional information on this cable is outlined in the AT&T Technical Reference Publication PUB TR62411 on "High Capacity Digital Service Channel Interface Specification."

If you are using RJ-48C cabling, a DA-15 to RJ-48C adaptor is available for use with standard network interface cables to connect to all types of customer network interfaces.

Determine Correct Distance

To determine the correct distance between the DSU/CSU and the T1 cable:

- Refer to *Determining the Distance between the DSU/CSU and the T1 Line Demarcation Point* on page A-15 for instructions.
- Then set the Line Build Out in Menu-4 Main Configuration (See Figure 3-2 on page 3-12).

Connecting a Multi-port Encore DSU/CSU

To connect a Multi-port Encore DSU/CSU to the T1 network:

Connect the network interface cable to the female DA-15 connector on the DSU/CSU, labeled NET, and then to the T1 network cable.

The DSU/CSU is in operating condition once it is connected to the DTE device and network.

Configuration 3

To configure a Multi-port Encore DSU/CSU, use:

- The terminal interface
- The front panel interface

The front panel interface is convenient when a terminal is not readily available. .

Required Information

Before you begin the initial configuration of a Multi-port DSU/CSU, gather:

- The DSU/CSU IP address and IP subnet mask — permit SNMP network management capability and establish a Telnet connection from a remote terminal.
- SNMP requires one to three NMS IP addresses.
- Framing and line code requirements as specified in the work order from your service provider.

Keep a Record

The default configuration is listed in Table A-14 on page A-13. Keep a written record of each individual DSU/CSU configuration. Use the Configuration Worksheet in Appendix C, *Configuration Worksheet*.

Check the Comm Port Settings

Before you connect the terminal, make sure the DSU/CSU Comm Port settings match the settings on the terminal, terminal server, or modem.

The default DSU/CSU Comm Port settings are:

- Baud rate—9600
- Parity bit—none
- Word length—8
- Stop bits—2

View and Modify the DSU/CSU Comm Port Settings

You can view and modify the Comm Port settings on the DSU/CSU only from the front panel interface. For instructions, refer to *Configuration Submenus* on page 5-8.

Switching Modes

To switch to Terminal mode when in DLMS mode, press Ctrl-x twice and then 0 (zero).

Connecting an ANSI Terminal

You can connect an ANSI-based VT100 compatible terminal to the Comm Port either directly, through a Digital Link Management Access Processor (MAP) in ASCII mode, terminal server, or a modem.

The DSU/CSU Comm Port (DC-9 connector), on the back panel, is compatible with ANSI-based VT100-compatible terminals or terminal emulation programs supporting this format.

If the Comm Port baud rate is 9600, the distance between the terminal and the DSU/CSU cannot exceed 50 feet.

NOTE: A proprietary collision avoidance algorithm between the DSUs using the CTS line enables communication from a single Comm Port with any DSU on the network. Pin 8 (CTS) on the female connector should not be connected to Pin 8 on the male connector. If your cable is not supplied by Digital Link, be sure pin 8 is not connected at the connector's terminal end. Refer to Table B-7 on page B-6.

To connect a terminal to the DSU/CSU Comm Port:

1. **Use a 9-pin RS-232 straight ribbon cable to connect the male 9-pin connector into the DB-9 female connector of the DSU/CSU.**
2. **Connect the opposite end of the cable to the DB-9 connector of the terminal.**

Connecting a Terminal Through a Modem

Use a null modem cable to connect a terminal through a modem.

NOTE: Digital Link can provide 9-pin to 25-pin adaptors, as well as a null-modem adaptor if required.

With a Comm Port baud rate of 9600, the distance between the terminal and the modem cannot exceed 50 feet. It is recommended, though not required, that you set Connection to Modem in Menu-8 Alarm II.

To connect a modem to the DSU/CSU Comm Port:

1. **Make sure you have a crossover (null) modem connection.**
2. **Make sure the DSU/CSU Comm Port settings match the modem settings.**

   If they do not, change the settings on the modem.
3. **Connect the modem to the DSU/CSU DB-9 connector.**
4. **Connect the modem to the phone line and terminal.**

Connecting DSU/CSUs in a Daisy Chain

You can connect up to 60 Multi-port Encore DSU/CSUs in a single RS-232 multi-drop (daisy-chain) for the purpose of monitoring and managing the DSU/CSUs from a single centralized workstation.

Use a ribbon-type cable with DC-9 connectors (available from Digital Link).

NOTE: CTS (pin 8) must be connected between the DSU/CSUs, and not connected to the terminal. Refer to Appendix B, *Connector Pin Assignments*.

To daisy-chain multiple systems together:

1. **Connect the female connector of the ribbon cable to the terminal or modem (if at a remote site).**
2. **Connect the male connector to the Comm Port on each DSU/CSU.**

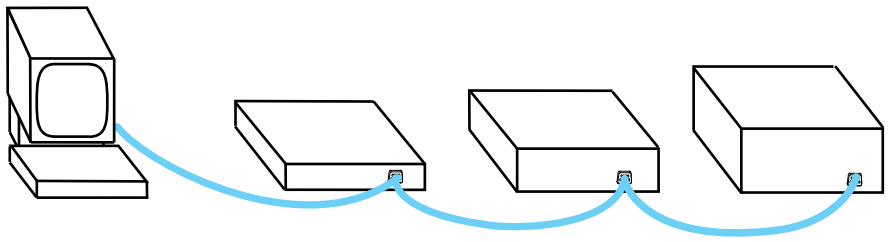

Figure 3-1 Daisy-chained Multi-port Encore DSU/CSUs

3

Access Rights

The DSU/CSU supports superuser or normal user access rights. The superuser has the priority (Table 3-1).

Table 3-1 Access Rights

Superuser	Nornal User
Log off a user already logged on the DSU/CSU	Be logged off by a superuser
Change both passwords	Log on only when no one is logged on
Clear both passwords	

Assigning User Passwords

It is important that you specify unique superuser and normal user passwords.

Two access methods to the DSU/CSU(s) are available (using a terminal connected to the Comm Port or a Telnet connection from a remote terminal). The security of your network depends on proper authorization:

- A “no passwords” situation gives any user logging on superuser access rights. If this user sets one password, the DSU/CSU uses the same password for both the user and superuser, with that password known only to that user. The result is one unknown user gaining exclusive control of that DSU/CSU.
- If you set only one password, the DSU/CSU uses the same password for both the user and superuser. As superuser, this user can gain exclusive control of the terminal interface.

NOTE: Set both passwords.

Setting Password Protection for the User Interface

When you log on to the DSU/CSU for the first time, set the superuser and the user password parameters (case-sensitive) in *Miscellaneous Management Configuration* on page 3-40.

Default value is an empty text string. No password is required to log on for the first time. If you do not set a password for either parameter, any user can access the DSU/CSU.

You can set both password parameters or only the superuser password. If you set only superuser password, the DSU/CSU uses the same password for both the user and superuser.

With the superuser password you can set or change the passwords.

Logging On and Off the DSU/CSU

The conditions for logging on differ when the DSU/CSU terminal interface is free or when another user is currently connected.

Use one of two methods to log on to the DSU/CSU:

- From a terminal (directly or through a modem) to the Comm Port
- From a remote terminal through a Telnet connection

Systems with blank IDs are always logged on and cannot be logged off until you assign a unit ID to that DSU/CSU.

The Unit ID

To log on to a DSU/CSU, you need the case sensitive unit ID of that DSU/CSU.

To display the unit ID of the DSU/CSU, press **Ctrl-x five times**.

If the ID does not appear, the DSU/CSU has a bad Comm Port configuration or connection.

Log On from a Terminal

The superuser always has access to the DSU/CSU, and disconnects a user that is currently logged on to that DSU/CSU.

To log on from a terminal (when no other user is logged on):

1. **Press Ctrl-x, type the unit ID, and press Return.**

   If the DSU/CSU is password protected and no other user is logged on, you are prompted with a message similar to:

   ```
   Current Unit ID is MAUI.
   Now you need a password     to log in:
   ```

2. **Type in the password, and press Return.**

   Menu-1 Main Status appears. If there is no response, you may have an incorrect ID or a bad Comm Port connection.

Log On Through Telnet

To log on with Telnet when no other user is logged on:

1. **Enter the telnet command and the IP address for the DSU/CSU.**

   If the DSU/CSU is password protected and no other user is logged on, you are prompted with a message similar to:

   ```
   Current Unit ID is MAUI.
   Now you need a password     to log in:
   ```

2. **Enter the Normal User or superuser password.**

Log On in Other Conditions

The DSU/CSU responds differently depending on who (user or superuser) is logged on.

NOTE: After the fifth unsuccessful attempt to log on, the .DSU/CSU closes the connection.

Superuser

The superuser has the rights to access the DSU/CSU at anytime. the If a user is logged on through Telnet and the superuser logs on, the DSU/CSU responds:

```
The Terminal User Interface is already in use. Please enter the
superuser password to force the other user to log off or type
<Ctrl-X> and try again later.
```

Enter the superuser password to log off the user, or press Ctrl-x to abort your login attempt.

User

Under general operations, use the user password to log on to the DSU/CSU. Should the superuser log on, the DSU/CSU automatically closes the user connection. If the user attempts to log on, the DSU/CSU responds:

```
The superuser is already logged on. Try again later.
```

Logging Off

To log off, press **Ctrl-x**.

When the terminal stops responding to your keystrokes, you are logged off.

Do not try to log on from a Telnet session when the DSU/CSU is in dial-up mode. Use a terminal or a terminal emulation program instead to log on directly to the DSU/CSU.

NOTE: Telnet sessions to multiple DSU/CSUs on a multi-drop line will result in intermittent delays to each Telnet session.

Using the Terminal Interface to Configure a DSU/CSU

To fully configure a Multi-port Encore DSU/CSU, set the parameters in the specified menus (refer to Table 3-2).

Table 3-2 Encore Multi-port DSU/CSU Menu Parameters

Parameter	Menu
Unit ID, Date, Time, AUX port	Menu-4 Main Configuration and T1 network parameters
Data port parameters	Menu-5 Data Port Configuration
Timeslot allocations	Menu-6 Timeslot Configuration
SNMP parameters	Menu-0 SNMP Config
Alarm conditions and thresholds, passwords and phone numbers	Menu-7 Alarm I and Menu-8 Alarm II

To select a menu, press the menu number (as indicated at the bottom of the screen).

To redraw or refresh the screen, press Ctrl-L.

Configuring the Menu-4 Main Parameters

Use Menu-4 Main Configuration to set the unit ID, date, time and T1 network parameters.

If you are using the optional port on the VX Encore, you can also set the AUX (DS1) port parameters.

Editing a Parameter

You can edit the parameters in a menu that appear in bold face. The other parameters are read-only.

To edit any parameter:

- Using an Arrow key, move to the value and press Return to activate edit mode—the value highlights and blinks.
- Use an Arrow key (or the Space Bar) to cycle through the available options, stop at the desired option and press Return to select it. Or, where appropriate, type in the required value.
- Type y to confirm your action if prompted to do so.

You can also use the u (up), d (down), r (right), and l (left) keys in place of the Arrows keys.

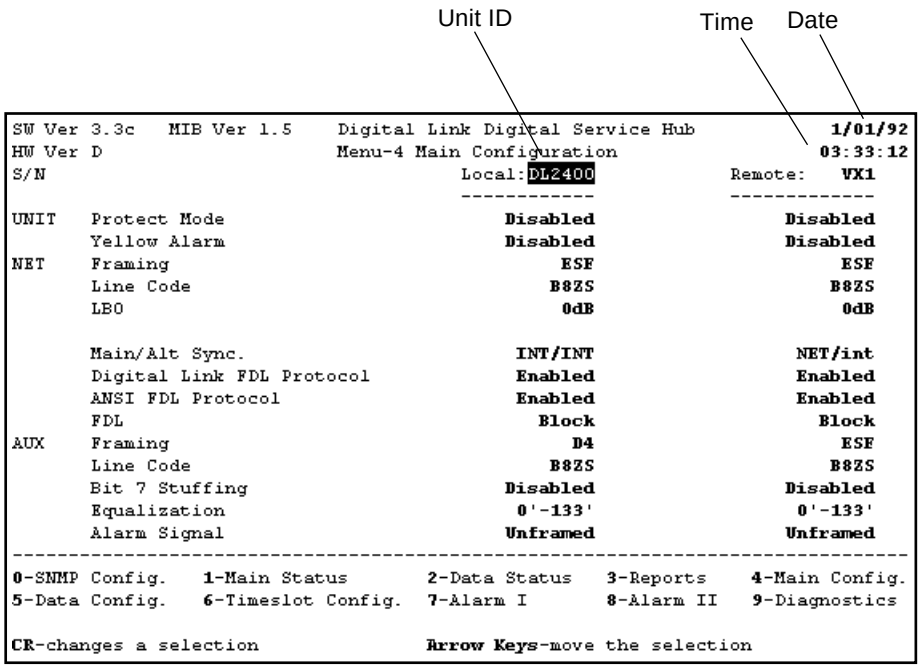
Unit ID
Time
Date
SW Ver 3.3c MIB Ver 1.5 Digital Link Digital Service Hub 1/01/92
HW Ver D Menu-4 Main Configuration 03:33:12
S/N Local: DL2400 Remote: VX1
UNIT Protect Mode Disabled Disabled
Yellow Alarm Disabled Disabled
NET Framing ESF ESF
Line Code B8ZS B8ZS
LBO 0dB 0dB
Main/Alt Sync. INT/INT NET/int
Digital Link FDL Protocol Enabled Enabled
ANSI FDL Protocol Enabled Enabled
FDL Block Block
AUX Framing D4 ESF
Line Code B8ZS B8ZS
Bit 7 Stuffing Disabled Disabled
Equalization 0'-133' 0'-133'
Alarm Signal Unframed Unframed
0-SNMP Config. 1-Main Status 2-Data Status 3-Reports 4-Main Config.
5-Data Config. 6-Timeslot Config. 7-Alarm I 8-Alarm II 9-Diagnostics
CR-changes a selection Arrow Keys-move the selection

Figure 3-2 Menu-4 Main Configuration in ESF

NOTE: DACS or Non DACS appears in NET Interface if the remote DSU/CSU is running an older firmware version.

Setting the Unit ID, Date and Time

To set the unit ID, date and time in Menu-4 Main Configuration:

1. **Press 4 to open Menu-4 Main Configuration.**
2. **To set the unit ID, move to the unit field using an arrow key**

3. **Press Return to select the field.**

   The field blinks (this is edit mode) and a prompt appears at the bottom of the screen:

   ```
   Please Enter an ID [6 characters maximum]:
   ```

4. **Type the unit ID and press Return.**

   Use up to six alphanumeric characters; do not begin with a number. Do not enter a blank ID. This causes the DSU/CSU to be always logged on.

   Each DSU/CSU is shipped with a unique default ID, a variant of its serial number (example: FE0086).

5. **Type y to confirm your action when the system prompts:**

   ```
   Do you really want to change the Configuration [Y/N]?
   ```

To set the date and time, use a similar procedure:

1. **Move to the date or time field using an Arrows key and press Return to select the field.**

2. **Enter the date or time as indicated by the prompt and press Return.**
   Example: 4/8/96 yields 4/08/96 and 22:6:7 yields 22:06:07 (The clock is a 24-hour clock.)

3. **Type y to confirm when prompted by the system:**

   ```
   Do you really want to change the Configuration [Y/N]?
   ```

NOTE: The software and hardware revision numbers are read-only.

Setting the Auxiliary Port and Network Parameters

The optional AUX (DS1) port is designed for connections to DS0 channelized customer premise devices such as channel banks and PBXs. To enable the DSU/CSU to convert the framing and line coding between the customer premise devices and the network, you select the framing and line coding on the AUX port independently from the network port.

The optional DS1 port monitors the PBX signal for the Blue (AIS) and Yellow alarms, Loss of Frame, Loss of Signal, BPV and ESF Error Events.

For framing and line code information, refer to your service provider work order.

Table 3-3 UNIT

Parameter	Setting	Description
Protect Mode	Enabled or Disabled	Default—Disabled. Enabled—Prevents you from running tests or making changes from the front panel.
Yellow Alarm Mode	Enabled or Disabled	Default—Enabled. Enabled—The DSU/CSU detects or generates a yellow alarm. Disabled—The DSU/CSU does not detect or generate a yellow alarm. In D4 framing format, DTE equipment (including frame relay equipment) using the HDLC or SDLC protocol may generate Yellow Alarm patterns as part of its normal traffic. The remote DSU/CSU may interpret these patterns as yellow alarms. In D4, yellow alarms also interfere with the data traffic. Therefore, it is recommended that you set this feature to Disabled.

Table 3-4 NET

Parameter	Setting	Description
Framing	ESF or D4	Default—ESF. Select the Network T1 framing format.
Line Code	B8ZS or AMI	Default—B8ZS. Select the Network T1 line code format.
LBO	0dB, -7.5dB, or -15dB	Default—0dB. Select the Line Build Out value used for tuning the attenuation between the DSU/CSU and the last repeater on the T1 circuit. For instructions, see *Factory Default Configuration* on page A-13.
Interface	Read-only	Default—DACS. In the new 3.2 firmware version, NET Interface is DACS read-only and does not appear in Menu-4 when both DSU/CSUs are running the new firmware version. The DSU/CSU uses the Main/Alt Sync timing source (temporarily switching to NETWORK timing only when in network loopback). The NET Interface appears in Menu-4 only when one of the DSU/CSUs is a Multi-port DSU/CSU or a Solo Encore/ SoloT1 running an older version containing NET Interface. On this DSU/CSU, you can configure NET Interface for DACS or Non DACS. In the new 3.2 firmware version, NET Interface appears blank on the screen when on the local DSU/CSU and DACS read-only when on the remote DSU/CSU.
DACS[1]		Select DACS if the DSU/CSU is connected to a Digital Access Cross Connect System that provides timing to all connected circuits. The specified clock selection is used even during tests. If it, or its alternate, is not available, the DSU/CSU uses NETWORK timing. If your application is fractional, set all connected DSU/CSUs to NETWORK timing.

Table 3-4 NET *(Continued)*

Parameter	Setting	Description
Non DACS		Non DACS automatically switches to ALTERNATE timing and, if this is not available, to INTERNAL timing. Select Non DACS if the DSU/CSU looses NETWORK timing.
Main/Alt Syn	INT, EXT[n], NET, and DATA [n] (DTE)	Default—NET/INT. Select the main clock source and then the alternate clock source for the T1 network transmitter. (Each source has the same options.) Type y to confirm each action. The DSU/CSU DSU/CSU always attempts to use the Main clock source. If this source is not available (due to a missing signal from the source or a diagnostic test), it uses the Alternate source.
NET		Select NET if the network is the clock source. If it is not, select INT (INTERNAL) at one T1 end, and NET at the other.
Digital Link FDL Protocol (ESF only)	Enabled or Disabled	Default—Enabled. Enabled—Enables the remote DSU/CSU display. To provide communications to the remote DSU/CSU via the T1 line, the local DSU/CSU sends Digital Link proprietary messages to the DSU/CSU through the T1 ESF Facility Data Link. These messages do not interfere with AT&T TR54016, which is automatically supported in ESF or ANSI T1.403 (enabled in ANSI FDL Protocol). Disabled—The proprietary messages are not sent, resulting in the loss of the remote display.

Table 3-4 NET *(Continued)*

Parameter	Setting	Description
ANSI FDL Protocol (ESF only)	Enabled or Disabled	Default—Enabled. Enabled—Enables the ANSI T1.403 FDL protocol. Disabled—Disables the protocol.
FDL (ESF only)	Block or Through	Default—Block. Through—Enables FDL transmission (in both directions) only between the network and the CSU or AUX port. During a transmission to the network port, the FDL link between the AUX or CSU port is broken. Block—Disables the above function. When the DSU/CSU has no traffic to send over the network FDL channel, it displays the HDLC IDLE flag. FDL appears on the screen only when the local and remote DSU/CSUs are in ESF and the remote DSU/CSU has an AUX port.

1. Applies only to DSU/CSUs running the old firmware version and containing NET Interface in Menu-4.

- DATA [n] Select a data port if the DTE device is the clock source.

  Use the appropriate V.35 or RS-449 DTE cable to configure the DSU/CSU as a DTE device. (See *Connecting to the DTE Devices* on page 2-10.)

  When neither the Main nor Alternate clock source is available, the DSU/CSU uses INTERNAL.

  To set the clock source to an external source, select EXT, connect the external clock mechanism to the BNC connector, labeled EXT CLOCK., and set the clock rate from the front panel interface. The recommended external clock source is a square wave of 50% duty cycle, TTL level (i.e. 0 to 2.4Vmin). The correct voltage range is 2.4 VDC minimum peak to peak and 5.0 VDC maximum peak to peak.

  During Loop Up/Loop Down Remote (full bandwidth), Smart Jack Set, Smart Jack Reset and all full bandwidth pattern tests, the DSU/CSU cannot use NETWORK timing. When performing the tests, the remote DSU/CSU is typically in network loopback and the local DSU/CSU should not be using NETWORK timing since the received network signal is the signal it generated. In such a case, the NETWORK

source is overridden and the alternate source (if available) or INTERNAL is used. When neither the main nor the alternate clock sources is available, INT (INTERNAL) is used.

Table 3-5 AUX

Parameter	Setting	Description
Framing	ESF or D4	Default—ESF. Select the DS1 DTE framing format for the auxiliary port.
Line Code	B8ZS or AMI	Default—B8ZS. Select the DS1 T1 line code format for the auxiliary port.
Bit 7 Stuffing	Enabled or Disabled	Default—Enabled. Enabled—The timeslots allocated to the auxiliary DS1 port are in BIT 7 STUFFING mode. This mode substitutes zero timeslots with 30H (the second most significant bit is one). Disabled—Disables this function.
Equalization	0′ to 133′, 133′ to 266′, 266′ to 399′, 399′ to 533′ and 533′ to 655′	Default—0′ to 133′. When you connect the ancillary equipment or the PBX to the AUX port, you may need to increase the distance between the DSU/CSU and the DS1 cross connect (patch panel) or the DS1 device. To do this, set the line equalization. With DS1 cross connect, select the distance between the DSU/CSU and the DS1 cross connect (maximum—655 ft.). With DS1 DTE device, select the double the distance between the DSU/CSU and the DS1 DTE device (maximum —1300 ft.).
Alarm Signal	Framed or Unframed	Default—Unframed. The VX Encore can send either an unframed or framed alarm signal to the PBX. This feature provides for: Framed— Sends framed all ones to the Aux port. Unframed— Sends unframed all ones to the Aux port.

Configuring the Data Ports

Use Menu-5 Data Port Configuration to configure the DSU/CSU data ports (DATA01, DATA02, DATA03, etc.).

In the example in Figure 3-3 the local DSU/CSU is a DL1200 with 12 ports and the remote DSU/CSU is a VX Encore.

```
SW Ver 3.3c    MIB Ver 1.5     Digital Link Digital Service Hub            1/01/92
HW Ver D                        Menu-5 Data Configuration                  04:15:12
                        Local:DL2400                          Remote:   VX1
        ------------------------------------   ------------------------------------
             Code  Loss  Mode  Format  Clock       Code  Loss  Mode  Format  Clock
DATA1      Normal  RTS   DCE    V.35    +SCT     Normal  RTS   DCE    V.35    SCTE
DATA2      Normal  RTS   DCE    V.35    +SCT     Normal  RTS   DTE    V.35    SCTE
DATA3      Normal  RTS   DCE    V.35    +SCT
DATA4      Normal  RTS   DCE    V.35    +SCT
DATA5      Normal  RTS   DCE    V.35    +SCT
DATA6      Normal  RTS   DCE    V.35    +SCT
DATA7      Normal  RTS   DCE    V.35    +SCT
DATA8      Normal  RTS   DCE    V.35    +SCT
DATA9      Normal  RTS   DCE    V.35    +SCT
DATA10     Normal  RTS   DCE    V.35    +SCT
DATA11     Normal  RTS   DCE    V.35    +SCT
DATA12     Normal  RTS   DCE    V.35    +SCT

                                  Page 1 of 2
-------------------------------------------------------------------------------
0-SNMP Config.   1-Main Status      2-Data Status   3-Reports    4-Main Config.
5-Data Config.   6-Timeslot Config. 7-Alarm I      8-Alarm II   9-Diagnostics

CR-changes a selection              Arrow Keys-move the selection
```

Figure 3-3 Menu-5 Data Port Configuration

Table 3-6 describes the parameters in Figure 3-3.

Table 3-6 Menu-5 Data Port Parameters

Parameter	Setting	Description
Code	NORMAL, HDLC, FORCED, DEFERRED	Default—NORMAL. NORMAL—This code makes the DTE device responsible for proper ones density (or the T1 line is configured for B8ZS). Additional ones are not inserted. HDLC—(High Level Data Link Control) The DSU/CSU receives HDLC data from the DTE device and inverts it (0 to 1, 1 to 0) to ensure proper ones density. The remote DSU/CSU inverts the data to the original polarity before passing it to the DTE device. FORCED—The DSU/CSU inserts a one into every DS0's eighth bit which reduces the port bandwidth and results in bandwidth in multiples of 56K. The remote DSU/CSU removes the 1s before passing data to the DTE device. DEFERRED—This code provides multiples of 64 Kbps data rates on T1 lines not using the DS0 timeslot least significant bit. The DSU/CSU uses only 7 out of every 8 bits in every DS0 timeslot. You must allocate additional timeslots to replace the missing bits; the DSU/CSU does not do this automatically. The total number of bits allocated to the data port is always a multiple of 8. The last allocated timeslot can have less than 7 utilized bits.
Loss	DTR, RTS or NONE	Default— RTS. Select the criteria the DSU/CSU uses for detecting a loss of signal.
MODE	DTE or DCE	Default—DCE. Configure the data port as a DTE (Data Terminal Equipment) or DCE (Data Circuit Equipment). Use the appropriate cable for each mode.

Table 3-6 Menu-5 Data Port Parameters *(Continued)*

Parameter	Setting	Description
Format	V.35 or RS-449	Default —V.35. Select the V.35 or RS-449 format. You can select X.21, EIA530 and other formats by using different cables. For EIA 530 or X.21 applications, use an EIA 530 or X.21 DTE cable and set to RS-449.
Clock	+SCT, -SCT, or SCTE	Default—+SCT. For DTE timing, select SCT, a unipolar clock generated by the DCE. You can invert the clock (-SCT) or not (+SCT). To correct delays in clocking due to cable length, select SCT inversion (-SCT) or SCTE. To use SCTE, the DTE device must support the option.

Allocating Timeslots

The default factory network timeslot allocation for bandwidth is all 24 DS0 timeslots allocated to data port 1.

It is your job to allocate timeslots for the data ports and the auxiliary port (if using the optional AUX port) in Menu-7 Timeslot Configuration according to your specific needs and requirements.

Allocate by Port—displays allocated timeslots for one port at a time only.

Network Timeslot Map displays the entire timeslot configuration.

The default factory allocation appears in Allocate by Port as —

```
DATA01 TS01-TS24 1536Kb/s
```

Three Allocation Methods

You can use one of three methods to allocate timeslots—Contiguous (default), Alternate and Manual. You select the allocation method in Allocation Type:

- Contiguous —You allocate timeslots in a contiguous order.

- Alternate—You allocate timeslots in an alternate order, with slots always odd numbered. Every even numbered slot is unused and filled with an All Ones pattern to maintain pulse density over T1 lines without a clear channel. Use this method to meet AT&T TR54019A requirements.
- Manual—The manual method allows you to allocate timeslots in an arbitrary random order which decreases the likelihood of unauthorized access via in-line taps.

Switching from Contiguous to Alternate

When you switch from Contiguous to Alternate, slots allocated in a contiguous range change to an alternate order and the even numbered slots become idle (I). In the menu, the idle timeslots are designated by a dashed blank line.

When you switch from Alternate to Contiguous order, all allocated slots in a range change to a contiguous order (Figure 3-4).

```
SW Ver 3.3c   MIB Ver 1.5    Digital Link Digital Service Hub          1/01/92
HW Ver D                  Menu-6 Timeslot Configuration               04:15:42
                    Local:DL2400                    Remote:   VX1
                    ------------                    -------------
Allocation Type     Contiguous                      Contiguous

Allocate by port:
                    DATA01 TS01-TS24  1536Kb/s      DATA01 TS01-TS24  1536Kb/s


Allocate by timeslot:
                                Network Time Slot Map
          1     2     3     4     5     6     7     8     9     10    11    12
Local     D01   D01   D01   D01   D01   D01   D01   D01   D01   D01   D01   D01
Remote    D01   D01   D01   D01   D01   D01   D01   D01   D01   D01   D01   D01

          13    14    15    16    17    18    19    20    21    22    23    24
Local     D01   D01   D01   D01   D01   D01   D01   D01   D01   D01   D01   D01
Remote    D01   D01   D01   D01   D01   D01   D01   D01   D01   D01   D01   D01
-------------------------------------------------------------------------------
0-SNMP Config.   1-Main Status       2-Data Status   3-Reports    4-Main Config.
5-Data Config.   6-Timeslot Config.  7-Alarm I       8-Alarm II   9-Diagnostics

CR-changes a selection              Arrow Keys-move the selection
```

Figure 3-4 Menu-6 Timeslot Configuration in Default Mode

Allocating Contiguous Timeslots

To allocate timeslots in a contiguous order, follow the method in the example below.

Example: You want to allocate: data port 1—slots 1 through 8, data port 2—slots 9 through 20, AUX port—slots 21 through 24.

You are starting with the default status—The allocation mode is Contiguous. **DATA01 TS01-TS24 1536Kb/s**

1. **Select data port 2:**
   - Move to Allocate by Port using an Arrow key and press Return to activate edit mode.

- Enter 2 for port 2 and press Return when prompted by the system.

```
DATA02 IDLE -IDLE appears in Allocate by Port.
```

2. **Allocate the start and end timeslots for port 2:**
   - Enter 9 when the system prompts for the start timeslot and press Return.
   - Enter 20 when the system prompts for the end timeslot and press Return.
   - Press y to confirm when the system prompts:
   - Do you really want to change the configuration?
   - Press y again to confirm when the system prompts:

```
Some timeslots are already assigned to other ports. Proceed. (Y
or N):
```

DATA02 TS11-TS24 896 Kb/s appears in Allocate by Port. Network Time Slot Map shows slots 1 through 8 allocated to port 1, slots 10 through 20 to port 2 and slots 21 through 24 to port 1.

3. **Select the AUX port:**
   - Move to Allocate by Port using an Arrow key and press Return to activate edit mode.
   - Use an Arrow key to cycle to AUX (or enter a) and press Return when prompted by the system.

```
AUX IDLE -IDLE appears in Allocate by Port.
```

4. **Allocate the start and end timeslots for port 2:**
   - Enter 21 and press Return when the system prompts for the start timeslot.
   - Enter 24 and press Return when the system prompts for the end timeslot.
   - Press y to confirm when the system prompts:

```
Do you really want to change the configuration?
```

   - Press y again to confirm when the system prompts:

```
Some timeslots are already assigned to other ports. Proceed. (Y
or N):
```

DATA02 TS11-TS24 896 Kb/s appears in Allocate by Port.

Network Time Slot Map shows slots 1 through 8 allocated to port 1, slots 10 through 20 to port 2 and slots 21 through 24 to AUX.

Table 3-7 Network Time Slot Map

	1	2	3	4	5	6	7	8	9	10	11	12
Local	D01	D01	D01	D01	D01	D01	D01	D01	D02	D02	D02	D02
	13	14	15	16	17	18	19	20	21	22	23	24
Local	D02	D02	D02	D02	D02	D02	D02	D02	AUX	AUX	AUX	AUX

Allocating Alternate Timeslots

To allocate alternate timeslots to one or more ports, follow the method shows in the example below.

Example: You want to allocate data port 1—slots 1 through 9, data port 2—slots 11 through 17, AUX port—slots 19 through 23.

You are starting with the default status—The allocation mode is Contiguous. **DATA01 TS01-TS24 1536Kb/s**

1. **To switch the Allocation Type from Contiguous to Alternate:**
   a. **Select Allocation Type and press Return to activate edit mode.**
   b. **Use an Arrow key to move to Alternate and press Return to select it.**
   c. **Press y to confirm the change when prompted.**

   ```
   All odd numbered slots are allocated to port 1.
   All even numbered slots are idle, or blank.
   ```

2. **To select data port 2:**
   a. **Move to Allocate by Port using an Arrow key and press Return to activate edit mode.**
   b. **Enter 2 when the system prompts and press Return.**

3. **To allocate the start and end timeslots for port 1:**

   a. **Enter 11 and press Return when the system prompts for the start timeslot.**

   b. **Enter 17 and press Return when the system prompts for the end timeslot.**

   c. **Press y to confirm when the system asks:**

   ```
   Do you really want to change the configuration?
   ```

   d. **Press y again to confirm when the system asks:**

   ```
   Some timeslots are already assigned to other ports. Proceed. (Y
   or N):
   ```

   DATA02 TS11-TS17 256 Kb/s appears in Allocate by Port.

4. **Select the AUX port:**

   a. **Move to Allocate by Port using an Arrow key and press Return to activate edit mode.**

   b. **Use an Arrow key to cycle to AUX and press Return when prompted by the system.**

   ```
   AUX IDLE -IDLE appears in Allocate by Port.
   ```

5. **Allocate the start and end timeslots for the AUX port:**

   a. **Enter 19 and press Return when the system prompts for the start timeslot.**

   b. **Enter 23 and press Return when the system prompts for the end timeslot.**

   c. **Press y to confirm when the system asks:**

   ```
   Do you really want to change the configuration?
   ```

   d. **Press y again to confirm when the system asks:**

   ```
   Some timeslots are already assigned to other ports. Proceed. (Y
   or N):
   ```

AUX TS19-TS23 192 Kb/s appears in Allocate by Port.

Network Time Slot Map shows all even numbered slots blank or idle and all odd numbered slot allocated.

Table 3-8 Network Time Slot Map

	1	2	3	4	5	6	7	8	9	10	11	12
Local	D01	---	D01	---	D01	---	D01	---	D01	---	D02	---
	13	14	15	16	17	18	19	20	21	22	23	24
Local	D02	---	D02	---	D02	---	AUX	---	AUX	---	AUX	---

Allocating Timeslots Manually

To allocate timeslots manually, follow the method in the example below.

Example: You want to allocate: data port 1—slots 1, 4 and 7, data port 2—slots 2, 5, and 9, AUX port—slots 3, 6, and 12.

You are starting with the default **DATA01 TS01-TS24 1536Kb/s** status—

1. **Change Allocation Type to Manual:**
   a. **Select Allocation Type and press Return to activate edit mode.**
   b. **Use the Up or Down Arrow and press Return to select Manual.**
   c. **Press y to confirm the change when the system prompts.**
2. **To specify data port 1:**
   a. **Move to Allocate by Port using the Down Arrow and press Return to activate edit mode.**
   b. **Enter 1 for port number 1 when the system prompts and press Return.**

   DATA01 appears in Allocate by Port.
3. **Manually allocate a single timeslot:**

a. **Enter 1 for timeslot 1 and press Return when the system prompts for the start timeslot.**

b. **Press 1 and Return when the system prompts for the end timeslot.**

c. **Press y to confirm the change.**
DATA01 TS01-TS01 appears.

```
Timeslot 1 in Menu-6 is allocated to port 1.
```

Repeat this procedure to allocate each timeslot individually to the assigned ports.

Table 3-9 Network Time Slot Map

	1	2	3	4	5	6	7	8	9	10	11	12
Local	D01	---	D01	---	D01	---	D01	---	D01	---	D02	---
	13	14	15	16	17	18	19	20	21	22	23	24
Local	D02	---	D02	---	D02	---	AUX	---	AUX	---	AUX	---

Configuring for SNMP

The four Multi-port Encore DSU/CSUs have a full embedded SNMP agent based on SNMP v1, supporting RFC 1406, MIB II, and Enterprise MIB.

To enable SNMP management capability, you need to configure the Multi-port DSU/CSU in Menu-0 SNMP Config.

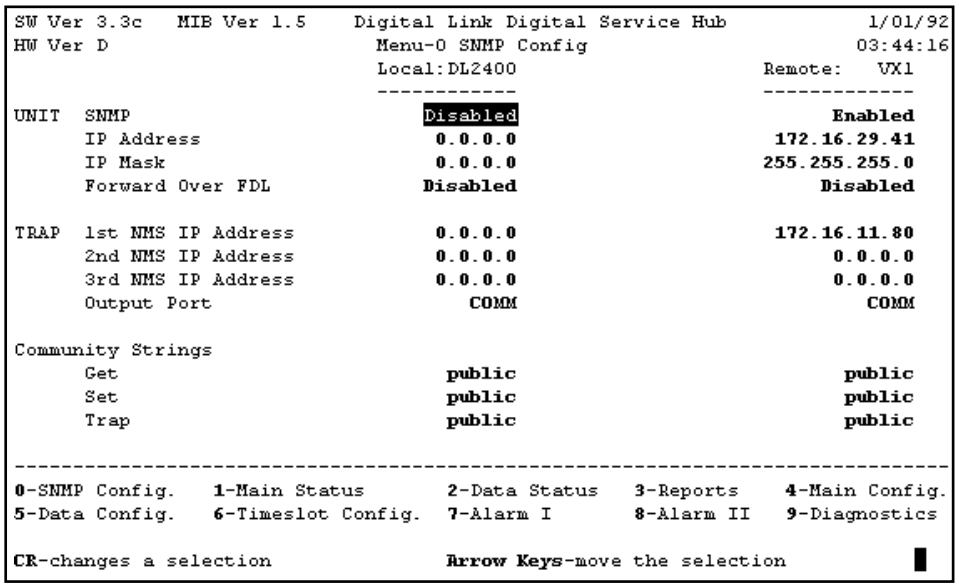
SW Ver 3.3c MIB Ver 1.5 Digital Link Digital Service Hub 1/01/92
HW Ver D Menu-0 SNMP Config 03:44:16
Local:DL2400 Remote: VX1
UNIT SNMP Disabled Enabled
IP Address 0.0.0.0 172.16.29.41
IP Mask 0.0.0.0 255.255.255.0
Forward Over FDL Disabled Disabled
TRAP 1st NMS IP Address 0.0.0.0 172.16.11.80
2nd NMS IP Address 0.0.0.0 0.0.0.0
3rd NMS IP Address 0.0.0.0 0.0.0.0
Output Port COMM COMM
Community Strings
Get public public
Set public public
Trap public public
0-SNMP Config. 1-Main Status 2-Data Status 3-Reports 4-Main Config.
5-Data Config. 6-Timeslot Config. 7-Alarm I 8-Alarm II 9-Diagnostics
CR-changes a selection Arrow Keys-move the selection

Figure 3-5 Menu-0 SNMP Config. in ESF Mode

Table 3-10 and Table 3-11 describes the parameters in Figure 3-5 and Figure 3-6.

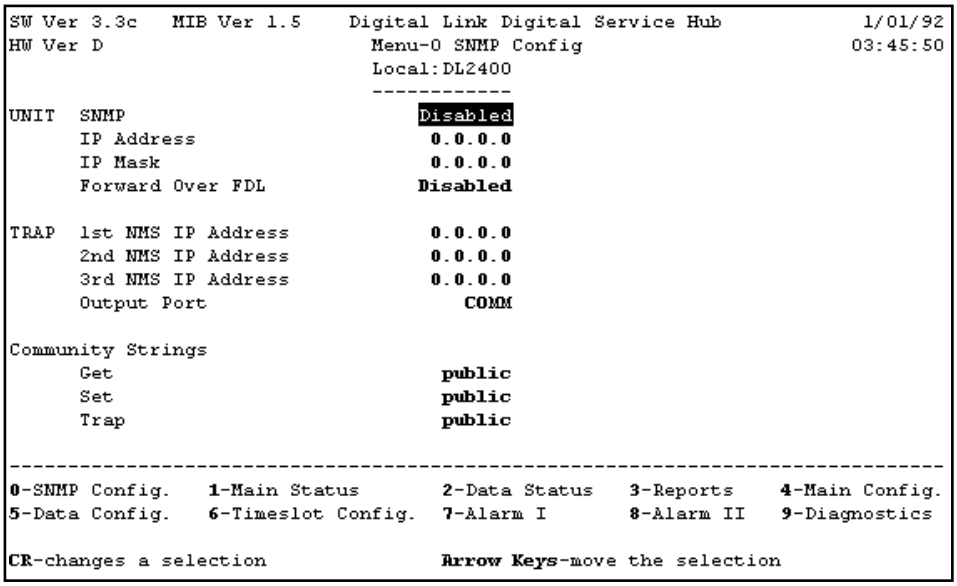
SW Ver 3.3c MIB Ver 1.5 Digital Link Digital Service Hub 1/01/92
HW Ver D Menu-0 SNMP Config 03:45:50
Local:DL2400
UNIT SNMP Disabled
IP Address 0.0.0.0
IP Mask 0.0.0.0
Forward Over FDL Disabled
TRAP 1st NMS IP Address 0.0.0.0
2nd NMS IP Address 0.0.0.0
3rd NMS IP Address 0.0.0.0
Output Port COMM
Community Strings
Get public
Set public
Trap public
0-SNMP Config. 1-Main Status 2-Data Status 3-Reports 4-Main Config.
5-Data Config. 6-Timeslot Config. 7-Alarm I 8-Alarm II 9-Diagnostics
CR-changes a selection Arrow Keys-move the selection

Figure 3-6 Menu-0 SNMP Config. in D4 Mode

Table 3-10 SNMP Parameters

Parameter	Setting	Description
Unit SNMP	Enabled or Disabled	Default—Disabled. Enabled—Enables use of your SNMP management application.
IP address	nnn.nnn.nnn.nnn	Default—0.0.0.0. nnn = 0 through 255. Enter the DSU/CSU IP address. Example—192.84.33.6
IP Mask	nnn.nnn.nnn.nnn	Default—0.0.0.0. nnn = 0 through 255. Enter the DSU/CSU IP mask. Example—255.255.255.0

Table 3-10 SNMP Parameters *(Continued)*

Parameter	Setting	Description
Forward Over FDL	Enabled or Disabled	Default—Disabled. Enabled—Enables the SNMP packets destined for the remote DSU/CSU to be automatically forwarded from the DSU/CSU over FDL (in ESF only).
TRAP 1st NMS IP Address	nnn.nnn.nnn.nnn	Default—0.0.0.0. nnn = 0 through 255. Enter the IP address of the first Network Management Server. The DSU/CSU sends trap messages to this server.
TRAP 2nd NMS IP Address	nnn.nnn.nnn.nnn	Default—0.0.0.0. nnn = 0 through 255. Enter the IP address of the second Network Management Server. The DSU/CSU sends trap messages to this server.
TRAP 3rd NMS IP Address	nnn.nnn.nnn.nnn	Default—0.0.0.0. nnn = 0 through 255. Enter the IP address of the third Network Management Server. The DSU/CSU sends trap messages to this server. If all three TRAP NMS IP addresses are set, the DSU/CSU sends a trap to all three network management servers.
Output Port	COMM or FDL	Default—COMM (ESF only). Select the port through which the DSU/CSU will send traps to the NMS.

Table 3-11 Community Strings

Parameter	Setting	Description
Get	Text string	*Default* — public. Enter an alphanumeric text string (maximum—32 characters) which the DSU/CSU SNMP agent will use to check GET requests from the SNMP management station for the DSU/CSU SNMP configuration.
Set	Text string	Default — public. Enter an alphanumeric text string (maximum—32 characters) which the SNMP agent on the DSU/CSU will use to check SET requests from the SNMP management station to set the SNMP configuration on the DSU/CSU.
Trap	Text string	Default — public. Enter an alphanumeric text string (maximum—32 characters) which the DSU/CSU SNMP agent will insert in SNMP TRAPs it sends to the SNMP management stations.

Configuring Alarms, Modems and Security

To configure the DSU/CSU to detect and report alarms, you use Menu-7 Alarms I. To configure it for external alarms, modem dial-out numbers and password security, you use Menu-8 Alarms II.

Figure 3-7 on page 3-35 shows Menu-7 and Figure 3-8 on page 3-37 shows Menu-8.

When the DSU/CSU detects an alarm condition, it reports it to the device connected to its Comm port or across the Facility Data Link. (The reports are compliant with AT&T Publication 62411 standards.)

Alarms are based on the sources, shown in Table 3-12.

Table 3-12 Alarm Sources and Events

Alarm Source	Alarm Event
T1 Network Port	Loss of Network Signal, Loss of Network Frame, Receive Blue Alarm from network (AIS), Receive Yellow Alarm from network
Data Port	Loss of Signal
AUX Port	Loss of Signal
Exceeded threshold	Three threshold settings in Menu-7 Alarm I—BPV Threshold Alarm, CRC Threshold Alarm OOF Threshold Alarm

This section describes how to set Menu-7 Alarms I and Menu-8 Alarms II.

How Alarms Are Reported

The DSU/CSU always reports all alarm conditions to:

- The device connected to its Comm Port (such as a terminal, printer or modem)
- The device connected to the remote DSU/CSU's Comm Port if Connection is set to FDL (in Menu-8 Alarm II on the local DSU/CSU)

If a modem is connected, the DSU/CSU causes the modem to dial out (if in Menu-7 Alarm I, alarms are Enabled and Block all Alarms is set to No and in Menu-8 Alarm II, Connection is set to Modem and valid telephone numbers are set in Phone Number 1 or Phone Number 2).

How Alarms Reports Are Displayed

The DSU/CSU displays alarms on a terminal at the bottom of the screen when a terminal is connected to the DSU/CSU Comm Port and you are logged on.

When you are not logged on, the alarm appears as a single line showing the unit ID, local or remote alarm, type of alarm, start or end of alarm and the time stamp.

Example — a carrier loss condition on a Data Port appears at the bottom of the screen as:

```
--Local ID:Oahu Data1 Carrier Loss Start: 07:17:37 Jan.22, 1996--
```

The alarm includes the unit ID, local or remote, type of alarm, start or end of alarm condition and date and time. It remains on the screen until a new alarm occurs or you select a new screen. When no alarm is present, a blank dotted line appears:

```
--------------------------------------------------------
```

An alarm appears the same way on the remote terminal connected to the DSU/CSU by a Telnet connection.

In DLMS mode, the DLMS receives the alarm and displays it on the DLMS console.

In SNMP mode, the system sends the alarm as a SNMP TRAP to the SNMP manager which displays it on the SNMP console.

Menu-7 Alarm I

Figure 3-7 shows Menu-7 and Figure 3-8 on page 3-37 shows Menu-8 alarms with descriptions beneath each section.

```
SW Ver 3.3c   MIB Ver 1.5    Digital Link Digital Service Hub          1/01/92
HW Ver D                        Menu-7 Alarm I                        04:16:05
                                      Local:DL2400            Remote:   VX1
                                      ------------            -------------
Block All Alarms                             No                        No
  NET Carrier Loss Alarm                  Enabled                   Enabled
  NET Sync Loss Alarm                     Enabled                  Disabled
  NET AIS Received Alarm                  Enabled                  Disabled
  NET Yellow Received Alarm               Enabled                  Disabled
  AUX Carrier Loss Alarm                  Enabled                   Enabled
  AUX Sync Loss Alarm                     Enabled                  Disabled
  AUX AIS Received Alarm                  Enabled                  Disabled
  AUX Yellow Received Alarm               Enabled                  Disabled
  DATA DTE Signal Loss Alarm              Enabled                   Enabled
  BPV Threshold Alarm                    Disabled                6 x 10^- 3
  CRC Threshold Alarm                    Disabled                  Disabled
  OOF Threshold Alarm                    Disabled                3 x 10^- 6


--------------------------------------------------------------------------------
0-SNMP Config.   1-Main Status      2-Data Status   3-Reports    4-Main Config.
5-Data Config.   6-Timeslot Config. 7-Alarm I      8-Alarm II   9-Diagnostics

CR-changes a selection              Arrow Keys-move the selection
```

Figure 3-7 Menu-7 Alarm I

The example in Figure 3-7 shows the remote DSU/CSU as a VX Encore. Table 3-13 describes the parameters in Figure 3-7.

Table 3-13 Menu-7 Alarm I Parameters

Parameter	Setting	Description
NET Carrier Loss Alarm	Enabled or Disabled	Default—Enabled.
NET Sync Loss Alarm	Enabled or Disabled	Default—Enabled.

Table 3-13 Menu-7 Alarm I Parameters *(Continued)*

Parameter	Setting	Description
NET AIS Received Alarm	Enabled or Disabled	Default—Enabled.
NET Yellow Received Alarm	Enabled or Disabled	Default—Enabled.
AUX Carrier Loss Alarm	Enabled or Disabled	(NA)
AUX Sync Loss Alarm	Enabled or Disabled	(NA)
AUX AIS Received Alarm	Enabled or Disabled	(NA)
AUX Yellow Received Alarm	Enabled or Disabled	(NA)
DATA DTE Signal Loss Alarm	Enabled or Disabled	Default—Enabled.
BPV Threshold Alarm	Set A and B in A x 10 ^ B	Default—Disabled. Example: 5 x 10^-4. If the BPVs exceed the set threshold, the alarm is started.
CRC Threshold Alarm	Set A and B in A x 10 ^ B	Default—Disabled. Example: 3 x 10^-4. If the CRCs exceed the set threshold, the alarm is started.
OOF Threshold Alarm	Set A and B in A x 10 ^ B	(Default—Disabled. Example: 7 x 10^-4. If the OOFs exceed the set threshold, the alarm is started
Power Supply Failure Alarm	Enabled or Disabled	Default—Disabled.
Controller Card Missing Alarm	Enabled or Disabled	Default—Disabled. The controller DSU/CSU is missing

Menu-8 Alarm II

From this menu, use an arrow key to select a submenu, and the Return key to enter that submenu.

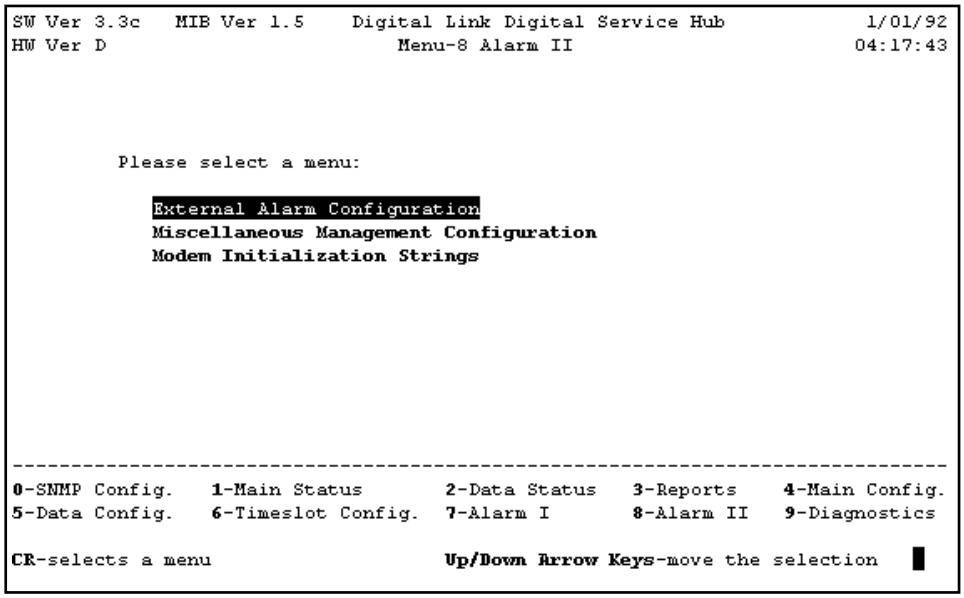
SW Ver 3.3c MIB Ver 1.5 Digital Link Digital Service Hub 1/01/92
HW Ver D Menu-8 Alarm II 04:17:43
Please select a menu:
External Alarm Configuration
Miscellaneous Management Configuration
Modem Initialization Strings
0-SNMP Config. 1-Main Status 2-Data Status 3-Reports 4-Main Config.
5-Data Config. 6-Timeslot Config. 7-Alarm I 8-Alarm II 9-Diagnostics
CR-selects a menu Up/Down Arrow Keys-move the selection

Figure 3-8 Menu-8 Alarm II

External Alarm Configuration

Use the External Alarm Configuration to define external alarms (Figure 3-9).

```
SW Ver 3.3c   MIB Ver 1.5    Digital Link Digital Service Hub          1/01/92
HW Ver D                        Menu-8 Alarm II                       04:18:18
                          External Alarm Configuration
                                        Local:DL2400          Remote:   VX1
                                        ------------          -------------
External Alarm Input Indication          Disabled                   Enabled
External Alarm Input Contacts        Normally Open              Normally Open
External Alarm Input Message                                          HELP

External Alarm Output Indication         Disabled                   Enabled
External Alarm Output Contacts       Normally Open            Normally Closed

--------------------------------------------------------------------------------
0-SNMP Config.   1-Main Status      2-Data Status   3-Reports    4-Main Config.
5-Data Config.   6-Timeslot Config. 7-Alarm I      8-Alarm II   9-Diagnostics

CR-changes a selection              Arrow Keys-move the selection
```

Figure 3-9 Menu-8 - External Alarm Configuration

Table 3-14 describes the parameters shown in Figure 3-9.

Table 3-14 External Alarm Configuration Parameters

Parameter	Setting	Description
External Alarm Input Indication	Enabled or Disabled	Default—Disabled. Enabled—Enables the SoloT1 to receive alarms from an external source (such as a door opening or a burglar alarm). You must have a device attached to the DB-9 connector (labeled ALARM IN/OUT) on the back panel. You can have more than one connection on the DB-9 connector.
External Alarm Input Contacts	Normally Open, Normally Closed	Default—Normally Open. Select Normally Open or Normally Closed depending on how the mechanism from the external source (such as a door opening or a burglar alarm) is set.
External Alarm Input Message	20 characters maximum	Enter an alarm message (20 maximum) that will appear when an external alarm occurs. External Alarm Input Indication must be enabled and External Alarm Input Contacts must be properly set.
External Alarm Output Indication	Enabled or Disabled	Default—Disabled. Set to Enabled to enable a device, connected to the ALARM OUT connector (such as a bell or light)
External Alarm Output Contacts	Default—Normally Open.	(View only) Normally Open —Always

Miscellaneous Management Configuration

Use Miscellaneous Management Configuration to define external communications parameters.

```
SW Ver 3.3c   MIB Ver 1.5     Digital Link Digital Service Hub          1/01/92
HW Ver D                          Menu-8 Alarm II                      04:18:55
                    Miscellaneous Management Configuration

                                        Local:DL2400              Remote:   VX1
                                        ------------              -------------
Connection                                    Direct                      Direct
Timeout When Logged On                      Unlimited                   Unlimited
Timeout When Not Logged On                  Unlimited                   Unlimited
Phone Number 1
Phone Number 2
Normal User Password                                *                           *
Superuser Password                                  *                           *
COMM    DCD                                 Disabled                    Disabled
        XON/XOFF                      XOFF until XON              XOFF until XON

DLC FDL Link Loss Alarm                     Enabled                     Enabled
Dial Out Time Interval                      23 Min.                     233 Min.

--------------------------------------------------------------------------------
0-SNMP Config.   1-Main Status       2-Data Status   3-Reports    4-Main Config.
5-Data Config.   6-Timeslot Config.  7-Alarm I       8-Alarm II   9-Diagnostics

CR-changes a selection               Arrow Keys-move the selection
```

Figure 3-10 Menu-8 - Miscellaneous Management Configuration

Table 3-15 describes these parameters.

Table 3-15 Miscellaneous Management Configuration Parameters

Parameter	Setting	Description
Connection	FDL, Modem, Direct	Default—Direct. In EFS mode, set to FDL (Facility Data Link—a four Kbit/s data channel provided by 12 of the 24 ESF framing bits, used by the carrier to request reports, clear error counters and activate loop backs) to enable a connection with the remote SoloT1. Set to Modem when using a modem connection.
Timeout When Logged On	1 Min, 15 Min. 60 Min., Unlimited	Default—Unlimited. Applies only when you are logged on. This is the time span after which, if it does not detect activity, the system warns that you will be logged off in 30 seconds.
Timeout When Not Logged On	1 Min, 15 Min. 60 Min., Unlimited	Default—Unlimited. Applies only when a terminal is connected through a modem and you are not logged on.This is the time span after which the modem disconnects the phone line if no activity is detected.
Phone Number 1	Default — empty text string	Applies only when you're connected through a modem. Enter a unique, valid Hayes-modem dial string. The modem dials out using the first dial string, then automatically tries the second dial string if the first does not respond.
Phone Number 2	Default — empty text string	Applies only when you're connected through a modem. Enter a valid and unique Hayes-modem dial string. The modem dials out using this second number when the first number does not respond. If the second number also fails, the DSU/CSU waits five minutes then automatically tries the first number again and continues in this pattern.
Normal User Password	Text string	Enter the login password for the Normal User (20 char. max).
Superuser Password	Text string	Enter the login password for the Superuser (20 char. maximum).

Table 3-15 Miscellaneous Management Configuration Parameters *(Continued)*

Parameter	Setting	Description
COMM DCD	Enabled, Disabled	Default—Disabled. Enabled —The Ensemble Encore uses the modem's Data Carrier Detect (DCD) signal to provide more robust modem operation. Disabled — Use Disabled if your null modem does not pass the Data Carrier Detect signal.
COMM XON/XOFF	Disabled, XOFF until ANY, XOFF until XON	Default—XOFF until XON. Set XOFF until ANY to use Ctrl-S to stop data flow from DSU/CSU, and any key to resume flow. Set XOFF until XON to use Ctrl-S to stop data flow from DSU/CSU, and Ctrl-Q to resume flow. Disabled— Disables the XON/XOFF feature.
Dial Out Time Interval		Use to extend time interval before modem dials out.

Modem Initialization

To initiate a modem connection, the DSU/CSU sends +++ followed by the first modem initialization string. The DSU/CSU waits for the modem response. The DSU/CSU waits for modem response so that it can guard against the possibility of losing the characters right after the modem reset command. After receiving the modem response, the DSU/CSU sends the second initialization string if it is programmed.

Solo T1 assumes that the modem always sends response; it is suggested that the modem not be programmed to override the response.

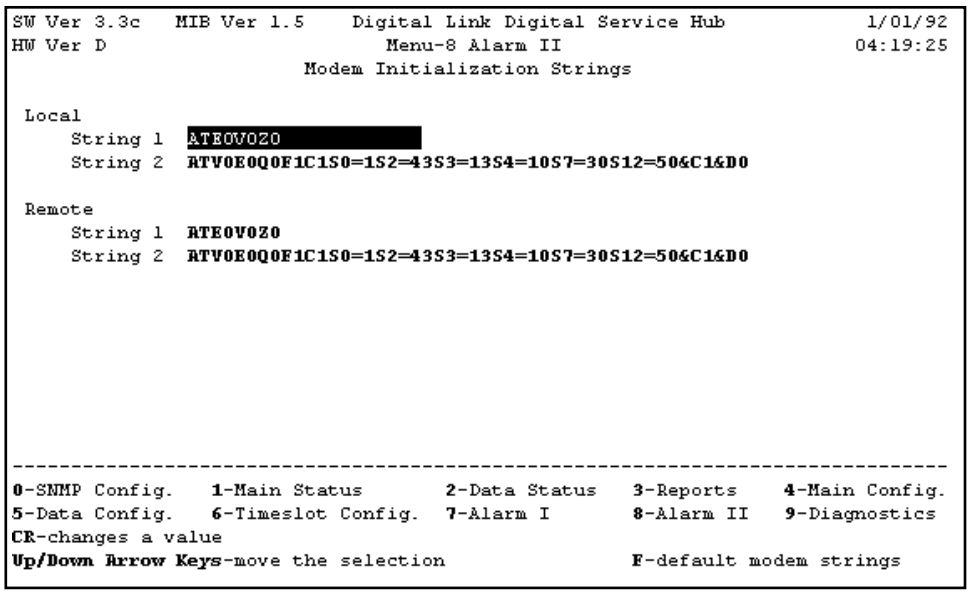
SW Ver 3.3c MIB Ver 1.5 Digital Link Digital Service Hub 1/01/92
HW Ver D Menu-8 Alarm II 04:19:25
Modem Initialization Strings
Local
String 1 ATE0V0Z0
String 2 ATV0E0Q0F1C1S0=1S2=43S3=13S4=10S7=30S12=50&C1&D0
Remote
String 1 ATE0V0Z0
String 2 ATV0E0Q0F1C1S0=1S2=43S3=13S4=10S7=30S12=50&C1&D0
0-SNMP Config. 1-Main Status 2-Data Status 3-Reports 4-Main Config.
5-Data Config. 6-Timeslot Config. 7-Alarm I 8-Alarm II 9-Diagnostics
CR-changes a value
Up/Down Arrow Keys-move the selection F-default modem strings

Figure 3-11 Menu-8 Modem Initialization Strings

If the modem reset command is used, it is recommended to program everything up to the reset command as the first modem initialization string. Program the rest of the commands as the second modem initialization string.

Monitoring and Management

4

The Multi-port Encore DSU/CSU collects and displays performance data (compliant with the AT&T TR54016 registers set) as well as additional data useful for network troubleshooting.

You can monitor and manage the DSU/CSU from a terminal, remote terminal Telnet connection, SNMP management station, or DLMS.

The DSU/CSU monitors the T1 line continuously and displays all collected data on the terminal screen.

The terminal interface menus enable you to:

- Monitor the status of the DSU/CSU and it ports—Menu-1 Main Status and Menu-2 Data DTE Status
- Monitor the T1 performance data base—Menu-3 Performance Reports
- Display or modify the configuration—Menu-4 Main Configuration, Menu-5 Data Port Config, Menu-6 Timeslot Config, Menu-7 Alarm I and Menu-8 Alarm II

This chapter describes how to use Menu-1 Main Status, Menu-2 Data DTE Status and Menu-3 Performance Reports to manage and monitor the Multi-port Encore DSU/CSU.

4

Monitoring Status

Monitor the status of the Multi-port Encore DSU/CSU from Menu-1 Main Status and the status of its ports from Menu-2 Data DTE Status

Menu-1 Main Status

The remote DSU/CSU in this example is a Solo Encore. (Figure 4-1)

```
SW Ver 3.3c   MIB Ver 1.5    Digital Link Digital Service Hub            1/01/92
HW Ver D                      Menu-1 Main Status                        04:10:52
                                Local:DL2400            Remote:   VX1
                                ------------            -------------
  Unit Status                         Normal                    Normal

  Network Status                      Normal                    Normal

  AUX DTE Status                      Normal                    Normal
  DATA DTE Status               Loss Of Signal            Loss Of Signal
  Alarm Input Status                  Normal                    Normal

  Error Free Seconds                   99.9%                    100.0%
  CRC Errors                             43                        0
  Bipolar Violations                 123254                    125296
  Out of Frame Events                     1                        0
   Seconds In Current 15 Min.           640                      593
   Errored Seconds In Interval            0                        0
   Unavailable Seconds In Interval        0                        0
--------------------------------------------------------------------------------
0-SNMP Config.   1-Main Status      2-Data Status   3-Reports    4-Main Config.
5-Data Config.   6-Timeslot Config. 7-Alarm I      8-Alarm II   9-Diagnostics

C-clears the counters                                                 ▮
```

Figure 4-1 Menu-1 Main Status in ESF Mode

To clear the counters:

1. **Press c.**
2. **Press y to confirm after the system prompt (press any other key to take no action.):**

   ```
   Do you really want to clear the error counters (Y/N)?
   ```

   Any status related to the counters may take up to a minute to clear. Error Free Seconds goes to 100%, values below CRC Errors are set to 0.

Menu-1 Main Status Parameters

All parameters in Menu-1 are read-only.

Unit Status

Unit Status shows if the DSU/CSU is operating normally of if any special conditions exits.

Table 4-1 Unit Status

Condition	Description
Normal	No abnormal conditions exist
Self Test	Unit is running self test.
DTE Loopback (full, AUX, DATAn)	Unit is in DTE loopback
Net Loopback (full)	Unit is in network loopback.
Send User 1 (full, AUX, DATAn)	Unit is sending User 1 pattern.
Send 1:4 (full, AUX, DATAn)	Unit is sending standard loop up remote code continuously.
Send QRW (full, AUX, DATAn)	Unit is sending QRSS code.
Send All 1's (full, AUX, DATAn)	Unit is sending all ones signal.

Table 4-1 Unit Status *(Continued)*

Condition	Description
Send All 0's (full, AUX, DATAn)	Unit is sending all zeros signal.
LP DN Remote (full, AUX, DATAn)	Unit is sending loopdown code to remote unit for 15 seconds.
No Clock	Clock source has failed.
Lamp Test	Unit is undergoing Lamp Test.
Smart Jack Reset	Unit is sending Smart Jack Reset code.
Smart Jack Set	Unit is sending Smart Jack Set code.
Send Keep Alive	Unit is sending All 1's Keep Alive signal.
Send Yellow Alarm	Unit is sending Yellow Alarm.

Network Status

Network Status indicates any abnormal conditions present on the received T1 signal.

Table 4-2 Network Status

Condition	Description
Normal operation	No abnormal conditions exist
Loss of Signal	Unit network signal is missing.
Loss of Frame	Unit network frame is missing.
Blue Alarm Received	Unit has received Blue Alarm (same as AIS)

AUX DTE Status

AUX DTE Status shows any abnormal conditions present on the received DS1 DTE signal. If the optional AUX port is not supported, this menu line does not appear.

Table 4-3 AUX DTE Status

Condition	Description
Normal	No abnormal conditions exist
Loss of Signal	DS1 DTE signal is missing.
Loss of Frame	DS1 DTE frame is missing.

DATA DTE Status

DATA DTE Status shows any abnormal conditions present on the received DATA DTE signal on a DTE port, DATA1 DTE, DATA2 DTE, DATA 3 DTE, etc.

Table 4-4 DATA DTE Status

Condition	Description
Normal Operation	No abnormal conditions exist
Loss of Signal	Loss of DTR or RTS DTE lines, user defined.

Table 4-5 DATA DTE Status

Parameter	Setting	Description
Alarm Input Status	Normal or 20-character user-defined description	Default—Normal. Normal—Select Normal
Error Free Seconds	0 to 100%	Gives the percentage of seconds that are error free.
CRC Errors (Cyclic Redundancy Check)	ESF Mode	An error checking scheme used to check the received data. The CRC bits within the framing are calculated using the contents of the frame. The calculation is performed again when the frame is received and the CRC values are compared. If they do not match, the frame is considered bad and the CRC statistic is incremented.
Bipolar Violations		An error checking scheme. This violation occurs when the ones bit is not represented with the opposite signal of the previous ones bit.
Out Of Frame Events	ESF Mode	An error checking scheme. An OOF occurs when two out of four consecutive framing bits are in error.
Seconds in Current 15 Minute		Gives the number of seconds that have occurred since in the current 15 minute interval. To reset to the beginning of the interval, press C.

Table 4-5 DATA DTE Status *(Continued)*

Parameter	Setting	Description
Errored Seconds in Interval		Gives the number of errored seconds detected in the receive T1 network signal since the beginning of the current 15 minute interval. An errored second in ESF mode is one or more CRC-6 or OOF events in a second. In D4 mode it is one or more OOF or BPV events in a second. This count clears at the end of event 15-minute interval or by pressing C.
Unavailable Seconds in Interval		In ESF mode, gives the number of seconds that have elapsed after the DSU/CSU received 10 consecutive SESs (Severely Errored Second indications).

Menu-2 Data DTE Status

Menu-2 Data DTE Status shows the current status of the local and remote ports.

The menu is the same in ESF and in D4 mode except that in D4 mode, the remote DSU/CSU does not display status.

Figure 4-2 below shows an example of Menu-2 Data DTE Status. The local DSU/CSU is a VX Encore and the remote DSU/CSU is either a Solo Encore or Ensemble Encore SoloT1.

```
SW Ver 3.3c   MIB Ver 1.5    Digital Link Digital Service Hub          1/01/92
HW Ver D                       Menu-2 Data Status                     04:11:47

Port    Local           Remote          Port    Local
------  --------------  --------------  ------  --------------
DATA1   Loss Of Signal  Loss Of Signal  DATA13  Normal
DATA2   Normal          Normal          DATA14  Normal
DATA3   Normal                          DATA15  Normal
DATA4   Normal                          DATA16  Normal
DATA5   Normal                          DATA17  Normal
DATA6   Normal                          DATA18  Normal
DATA7   Normal                          DATA19  Normal
DATA8   Normal                          DATA20  Normal
DATA9   Normal                          DATA21  Normal
DATA10  Normal                          DATA22  Normal
DATA11  Normal                          DATA23  Normal
DATA12  Normal                          DATA24  Normal


--------------------------------------------------------------------------------
0-SNMP Config.   1-Main Status      2-Data Status   3-Reports    4-Main Config.
5-Data Config.   6-Timeslot Config. 7-Alarm I      8-Alarm II   9-Diagnostics
```

Figure 4-2 Menu-2 Data DTE Status

Data DTE Status Parameters

Data Port #—Local Test, Signal Loss, Normal

Indicates the port status.

If the local or remote DSU/CSU does not have a port in this position the field is blank. Signal Loss and Local Test are mutually exclusive since the same interface lines used to initiate the test are also used to indicate the signal loss.

Monitoring Performance

Each Multi-port Encore DSU/CSU collects and displays performance data (compliant with the AT&T TR54016 registers set) as well as additional parameters to help you in network troubleshooting.

To monitor the DSU/CSU, use Menu-3 Performance Reports (Figure 4-3).

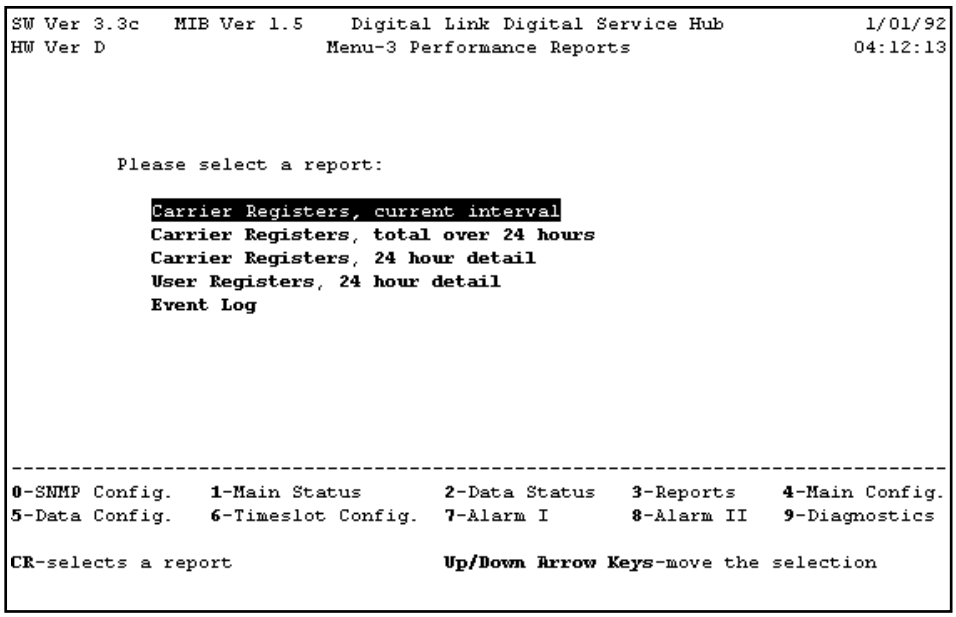
SW Ver 3.3c MIB Ver 1.5 Digital Link Digital Service Hub 1/01/92
HW Ver D Menu-3 Performance Reports 04:12:13
Please select a report:
Carrier Registers, current interval
Carrier Registers, total over 24 hours
Carrier Registers, 24 hour detail
User Registers, 24 hour detail
Event Log
0-SNMP Config. 1-Main Status 2-Data Status 3-Reports 4-Main Config.
5-Data Config. 6-Timeslot Config. 7-Alarm I 8-Alarm II 9-Diagnostics
CR-selects a report Up/Down Arrow Keys-move the selection

Figure 4-3 Menu-3 Performance Reports in ESF Mode

To select a report, use the Arrow keys to move to the report and press Return.

The first three reports display the carrier registers according to AT&T TR54016. The carrier registers are the same as those reported over the FDL in response to FDL requests and can be cleared only by the carrier.

The fourth report displays the user registers. You can clear these if necessary.

NOTE: The maximum error count displayed in the performance reports is 65,535. The actual value may be higher.

Events in the Performance Reports

The events in the Menu-3 Performance Reports are:

- Errored Seconds (ES)

  In ESF framing, a second with one or more ESF frame errors or CRC-6 errors.

- Unavailable Seconds (US)

  In ESF mode, the number of seconds elapsed after 10 consecutive SES events are received.

- Severely Errored Seconds (SES)

  In ESF mode, a second during which 320 or more CRC-6 violations or OOF events have occurred.

- Bursty Errored Seconds

  In ESF mode, a second during which more than one but less than 320 CRC-6 errors have occurred.

- Loss of Frame Count

  In ESF mode, the number or times Loss of Frame is declared.

Carrier Register, Current Interval

The DSU/CSU displays performance data for the most current 15-minute interval (Figure 4-4).

```
SW Ver 3.3c   MIB Ver 1.5    Digital Link Digital Service Hub          1/01/92
HW Ver D                  Menu-3 Performance Reports                  04:12:40
                     Carrier Registers, Current Interval

                          Local:DL2400        Remote:   VX1
                          ------------        ----------
  Unavailable Signal State          No                   No
  Payload Loopback (PLB) Actuated   No                   No
  ESF Error Event Counter           43                    2
  Current Interval Timer           643                  706

  Errored Seconds (ES)               0                    0
  Unavailable Seconds (UAS)          0                    0
  Severely Errored Seconds (SES)     0                    0
  Bursty Errored Seconds (BES)       0                    0
  Loss Of Frame Count (LOFC)         0                    0



--------------------------------------------------------------------------------
0-SNMP Config.   1-Main Status      2-Data Status   3-Reports    4-Main Config.
5-Data Config.   6-Timeslot Config. 7-Alarm I      8-Alarm II   9-Diagnostics
```

Figure 4-4 Menu-3, Carrier Registers, Current Interval in ESF Mode

Carrier Registers, Total over 24 Hours

Carrier Registers, total over 24 hours displays performance data for the last 24 hour period.

The data is organized and displayed in 96 15-minute intervals. Included are a complete complement of AT&T TR54016 registers and ES, US, SES, and LOFC counts, as shown in Figure 4-5.

- Errored Seconds (ES)
- Unavailable Seconds or Failed Seconds (US or FS)
- Severely Errored Seconds (SES)
- Bursty Errored Seconds (BES)
- Loss Of Frame Count (LOFC)

In the example in Figure 4-5, the local DSU/CSU is a DL2400 and the remote DSU/CSU is a VX Encore.

```
SW Ver 3.3c   MIB Ver 1.5    Digital Link Digital Service Hub          1/01/92
HW Ver D                  Menu-3 Performance Reports                  04:13:10
                    Carrier Registers, total over 24 hours


                          Local:DL2400         Remote:   VX1
                          ------------         -------------
  Errored Seconds (ES)              10                     0
  Unavailable Seconds (UAS)          0                     0
  Severely Errored Seconds (SES)     0                     0
  Bursty Errored Seconds (BES)      10                     0
  Loss Of Frame Count (LOFC)         2                     3

  Total Valid Intervals             16                     2




--------------------------------------------------------------------------------
0-SNMP Config.   1-Main Status       2-Data Status   3-Reports     4-Main Config.
5-Data Config.   6-Timeslot Config.  7-Alarm I       8-Alarm II    9-Diagnostics
```

Figure 4-5 Menu-3, Carrier Registers, Total Over 24 Hours in ESF Mode

Carrier Registers, 24 Hour Detail

Performance data for the last 24 hours is displayed in the Carrier Registers, 24 hour detail menu as shown in the example in Figure 4-6.

```
SW Ver 3.3c   MIB Ver 1.5    Digital Link Digital Service Hub          1/01/92
HW Ver D                  Menu-3 Performance Reports                   04:13:36
                       Carrier Registers, 24 hour detail
                     Local:DL2400                        Remote:   VX1
Local Interval       ------------                        -------------
Start        ES   UAS   SES   BES  LOFC          ES   UAS   SES   BES  LOFC
03:46:57     10     0     0    10     1           0     0     0     0     1
03:31:57      0     0     0     0     0           0     0     0     0     2
03:16:57      0     0     0     0     0         ---   ---   ---   ---   ---
03:01:57      0     0     0     0     0         ---   ---   ---   ---   ---
02:46:57      0     0     0     0     0         ---   ---   ---   ---   ---
02:31:57      0     0     0     0     0         ---   ---   ---   ---   ---
02:16:57      0     0     0     0     0         ---   ---   ---   ---   ---
02:01:57      0     0     0     0     0         ---   ---   ---   ---   ---
01:46:57      0     0     0     0     0         ---   ---   ---   ---   ---
01:31:57      0     0     0     0     0         ---   ---   ---   ---   ---
01:16:57      0     0     0     0     0         ---   ---   ---   ---   ---
01:01:57      0     0     0     0     0         ---   ---   ---   ---   ---
                              Page 1 of 8
--------------------------------------------------------------------------------
0-SNMP Config.   1-Main Status       2-Data Status   3-Reports    4-Main Config.
5-Data Config.   6-Timeslot Config.  7-Alarm I       8-Alarm II   9-Diagnostics

Up/Down Arrow Keys-scroll the registers
```

Figure 4-6 Menu-3, Carrier Registers, 24 Hour Detail in ESF Mode

The local DSU/CSU is a VX Encore and the remote DSU/CSU could be:

- Solo Encore
- VX Encore
- DL100 Encore
- DL1200
- DL2400
- An Ensemble Encore SoloT1.

User Registers, 24 Hour Detail

Performance data in the user registers for the last 24 hours is displayed in the User Registers, 24 hour detail menu as shown in the example in Figure 4-7 below.

```
SW Ver 3.3c   MIB Ver 1.5    Digital Link Digital Service Hub          1/01/92
HW Ver D                  Menu-3 Performance Reports                  04:14:07
                        User Registers, 24 hour detail
              Local:DL2400                                 Remote:   VX1
Interval      ------------                                 -------------
Start       ES    US    CRC    BPV    00F          ES    US    CRC    BPV    00F
03:45:12    11     0     43  10000      1           0     0      0  10000      0
03:30:12     0     0      0      2      0           0     0      0      7      0
03:15:12     0     0      0      0      0         ---   ---  -----  -----  -----
03:00:12     0     0      0      0      0         ---   ---  -----  -----  -----
02:45:12     0     0      0      0      0         ---   ---  -----  -----  -----
02:30:12     0     0      0      0      0         ---   ---  -----  -----  -----
02:15:12     0     0      0      0      0         ---   ---  -----  -----  -----
02:00:12     0     0      0      0      0         ---   ---  -----  -----  -----
01:45:12     0     0      0      0      0         ---   ---  -----  -----  -----
01:30:12     0     0      0      0      0         ---   ---  -----  -----  -----
01:15:12     0     0      0      0      0         ---   ---  -----  -----  -----
01:00:12     0     0      0      0      0         ---   ---  -----  -----  -----
                                Page 1 of 8
--------------------------------------------------------------------------------
0-SNMP Config.   1-Main Status       2-Data Status   3-Reports    4-Main Config.
5-Data Config.   6-Timeslot Config.  7-Alarm I       8-Alarm II   9-Diagnostics

Up/Down Arrow Keys-scroll the registers              C-clears the registers
```

Figure 4-7 Menu-3, User Registers, 24 Hour Detail Report in ESF Mode

The local DSU/CSU is a DL1200 and the remote one of the following: a Solo Encore, VX Encore, DL100 Encore, DL1200, DL2400, or an Ensemble Encore SoloT1.

Only the User Registers performance report can be cleared. (This reset the Error Free Seconds in Menu-1 Main Status to 100% in Menu-1.) The Carrier Registers performance report cannot be cleared.

Displaying the Performance Report in D4 Mode

Two performance reports are available in D4 mode:

- User Registers with 24 hour detail
- Event Log

In Figure 4-9, the local DSU/CSU is a VX Encore and the remote is one of the following: a Solo Encore, VX Encore, DL100 Encore, DL1200, DL2400, or an Ensemble Encore SoloT1.

Displaying the Event Log

The Event Log display is shown in the Figure 4-8 example below.

```
SW Ver 3.3c   MIB Ver 1.5    Digital Link Digital Service Hub          1/01/92
HW Ver D                  Menu-3 Performance Reports                  04:14:33
                                  Event Log

Log  Local      Module  All            Event  0. All Events

Seq. No.    Status  Module             Description                  Time/Date
----------  ------  ------  ---------------------------------  -----------------
        31  start   System  Remote Responds to DLC FDL         04:00:08  1/01/92
        30  end     Net     Blue Alarm Received                03:59:53  1/01/92
        29  start   Net     Blue Alarm Received                03:59:53  1/01/92
        28  end     Net     Loss of Signal                     03:59:53  1/01/92
        27  start   Net     Loss of Signal                     03:59:51  1/01/92
        26  end     Net     Loss of Signal                     03:59:51  1/01/92
        25  start   Net     Loss of Signal                     03:58:59  1/01/92
        24  end     Net     Loss of Signal                     03:58:59  1/01/92
        23  end     System  Remote Responds to DLC FDL         03:58:57  1/01/92
        22  start   Net     Loss of Signal                     03:58:56  1/01/92
                  Page  1 of  4         31 out of  31 selected
-------------------------------------------------------------------------------
0-SNMP Config.   1-Main Status       2-Data Status   3-Reports    4-Main Config.
5-Data Config.   6-Timeslot Config.  7-Alarm I       8-Alarm II   9-Diagnostics

Up/Down Arrow Keys-scroll the log                   C-clears the log
```

Figure 4-8 Menu-3 Event Log

Event Log Parameters

Log - Local or Remote (Default - Local)

Select for either Local or Remote event log.

Module - displays either Unit, DTE (fraction), Network, AUX, System or All (Default - All)

The field allows the display of either of the above status changes. The following status changes can be logged as events:

Unit - Unit Power On, Self Test, DTE Loopback (fraction), Net Loopback (FULL), PLD Loopback (fraction), LP UP Remote (fraction), LP DN Remote (fraction), Send User 1 (fraction), Send User 2 (fraction), Send 1:1 (fraction, Send 1:2 (fraction), Send 1:4 (fraction), Send 1:7 (fraction), Send 3:24 (fraction), Send QRW (fraction), Send All 1's (fraction), Send All 0's (fraction), No Clock, Lamp Test, Smart Jack Reset, Smart Jack Set, Send Keep Alive, Send Yellow Alarm, Controlled Slip, Inject a Pattern Error, Clear Patter Error Counter, Clear Event Log, Clear Current Carrier Registers, Clear Carrier Archives, Clear Carrier ESF Error Events, Clear Current User Registers, Clear User Archives, Clear User CRC Errors, Clear User BPV Errors, Clear User 00F Errors, Clear All user Error Counters, Clear 24 Hour User Registers, Back to Factory Config

DTE - Loss of Signal, Local Test

Network - Loss of Signal, Loss of Frame, Blue Alarm Received, Yellow Alarm Received, Set Code Received, Reset Code Received, BPV Threshold Exceeded, CRC Threshold Exceeded, 00F Threshold Exceeded

AUX - Loss of Signal, Loss of Frame, Blue Alarm Received, Yellow Alarm Received

System - External Alarm, Power Supply Failure, Controller Module Missing, Remote Responds to DLC FDL

Event - This field allows a particular type of event to be displayed (Default - 0, All).

Enter an event index or use the cursor up/down keys to scroll through all the event options. While selecting the event, the event description text changes with the index. The event description text is displayed under the Description column in the event log menu.

If the Event field is left blank, the Event filter parameter is disabled.

NOTE: Only selected Module and Events are displayed.

The event log is saved in RAM and is bounded by the available run-time memory. When the log overflows, the oldest events are deleted to make room for the latest events.

The event log is also available from a remote DSU/CSU.

Commands are logged by the executing rather than the initiating DSU/CSU. For example, in Menu-9 Diagnostics, if a remote test is started on a DSU/CSU, the event will only be logged by the remote DSU/CSU.

The event log can be cleared by typing C; which flushes the event log.

Seq. No - A string of 32-bit numbers starting from 1 to 232-1 that uniquely identifies a DSU/CSU.

The Front Panel 5

This chapter describes the front panel interface of the DL100 Encore, DL1200, DL2400 and VX Encore.

The front panel provides access to these menus:

- MONITOR —to check the DSU/CSU
- TEST — Run diagnostics on the DSU/CSU
- CONFIGURATION — to view and/or change the DSU/CSU configuration

The front panel keys are:

- EXIT — Moves up a menu
- UP ARROW — Select parameters, other settings, characters, or numbers
- DOWN ARROW — Select parameters, other settings, characters, or numbers
- ENTER — Move down a menu level, edit a parameter, or modify information

From here on, the Up or Down arrow keys are simply Up or Down key.

With a little practice, you can use the front panel rapidly. Don't worry about making a mistake, it's easy to fix it. Figure 5-2 on page 5-5 shows the menu tree and subsequent sections explain how to use the Exit, Up, Down, and Enter key functions.

What is Not Available on the Front Panel

The front panel does not provide for setting:

- Alarm conditions and thresholds
- Superuser and Normal User passwords
- Modem connection and telephone numbers

You must use the terminal interface to set these parameters.

The Interface

The front panel interface consists of a 16 character fluorescent display and four keys. The interface displays one line of information at a time. You use the four keys to interact with the front panel interface.

Figure 5-1 shows the front panel or a VX Encore.

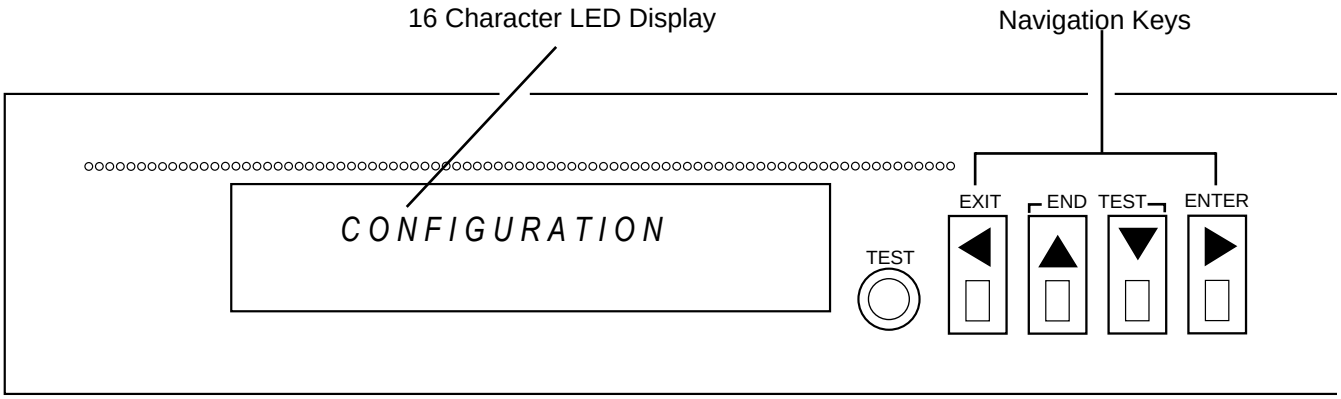

Figure 5-1 Front Panel Interface

NOTE: If this is a remote DSU/CSU, the left-most character in the fluorescent display displays an R.

The front panel interface can be disabled only from the terminal interface, using Protect Mode in Menu-4, Main Configuration.

Using the Front Panel

The top of the menu tree is "EFS 100 PERCENT." If you press the ENTER key, you enter the menu tree. Use the up or down button to select move through the menus (Configuration, Test, or Monitor). (Refer to Figure 5-2 on page 5-5.)

Table 5-1 shows the key functions.

Table 5-1 Front Panel Keys

Moving about	**Front Panel Key(s)**
To cycle through the available options	Up (▲) or Down (▼) arrow
To move down one menu level	ENTER
To move up one menu level	EXIT
To open a menu	ENTER
To return to the top menu	Press until EXIT you see EFS 100 PERCENT
Editing Functions	
To activate edit mode	ENTER
To execute a change in the configuration	ENTER
To exit without executing a change	EXIT until you see EFS 100 PERCENT
Testing Functions	
To end any test	Press both the Up (▲) and Down (▼) arrows at the same time

Changing Information

Most of the menus are toggles: pressing either the up or down arrow key changes the parameter from Yes to No, or Disabled to Enabled, or some other setting according to that parameter features. (Refer to Chapter 3 for descriptions of individual parameters.)

In the CONFIGURATION menu, you can modify the information.

For example, to change the UNIT ID (at the beginning, EFS 100 PERCENT):

1. **Press ENTER.**

   The menu you see is CONFIGURATION.

2. **Press ENTER.**

   The menu you see is UNIT CONFIG.

3. **Press the Down arrow key.**

   The menu you see it UNIT ID.

4. **Press the ENTER key.**

   In edit mode the first LED character blinks showing that it is ready for your change.

5. **Press the Down key.**

   The first LED character changes. Each time you press the Down key, an alphabet character is shown. At the end of the alphabet, as you continue to press the down key, you find the 0 through 9 numerals.

   In Edit mode, the up or down keys give access to: A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

   When you decide which character to use, press the ENTER key. The first LED character key is locked, and the second flashes to show its readiness for your change.

These steps apply to all parts of the CONFIGURATION menus. For the other menus, choosing either the Up or Down key changes the parameter or test setting.

Monitor Submenus

Figure 5-2 shows the MONITOR submenu and related submenus. For more information on the parameters, refer to Chapter 4, *Monitoring and Management*.

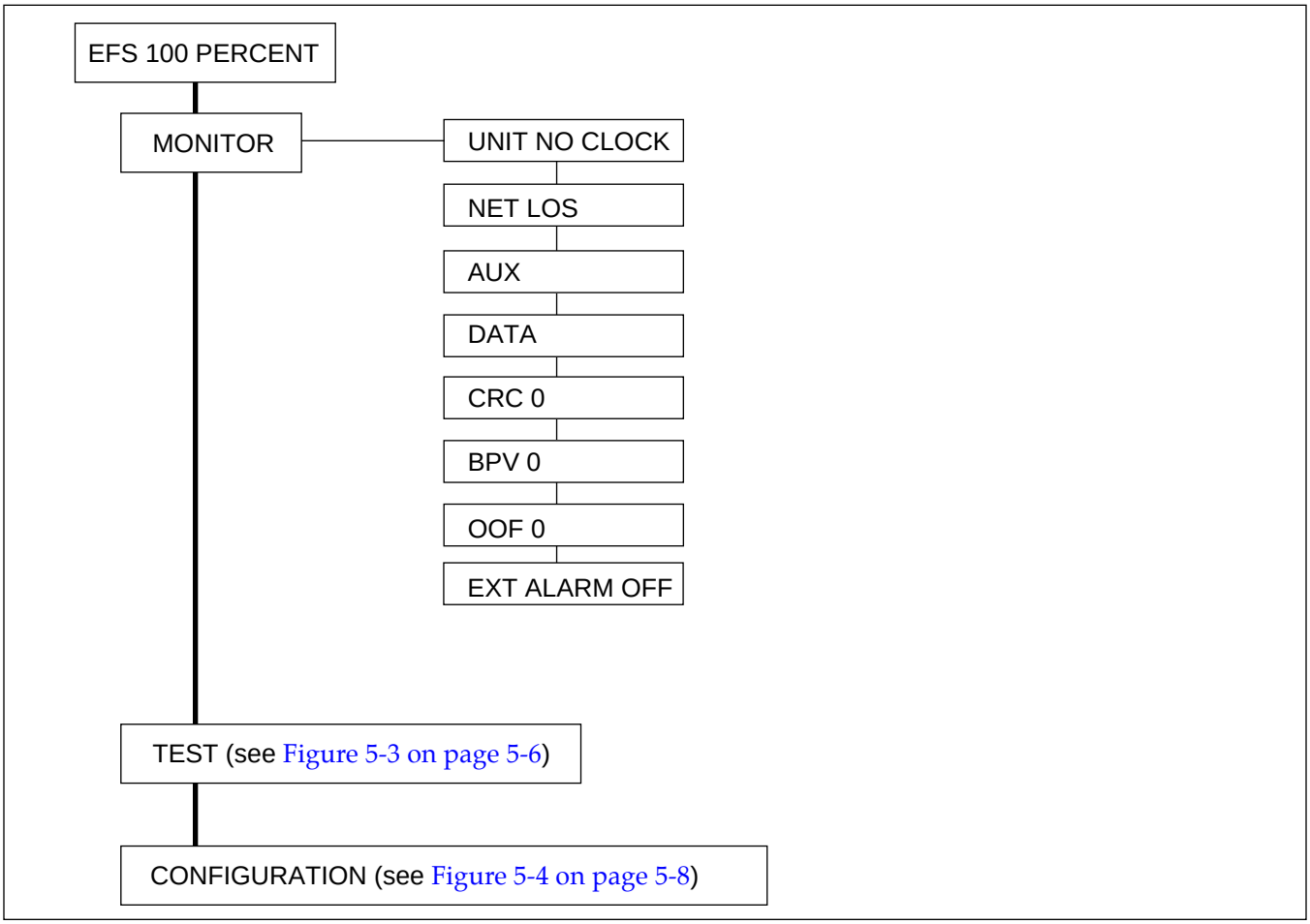

Figure 5-2 The Front Panel Menu Tree, MONITOR

Test Submenus

Figure 5-3 shows the TEST submenu and related submenus. For more information on the parameters, refer to Chapter 6, *Diagnostics and Troubleshooting*.

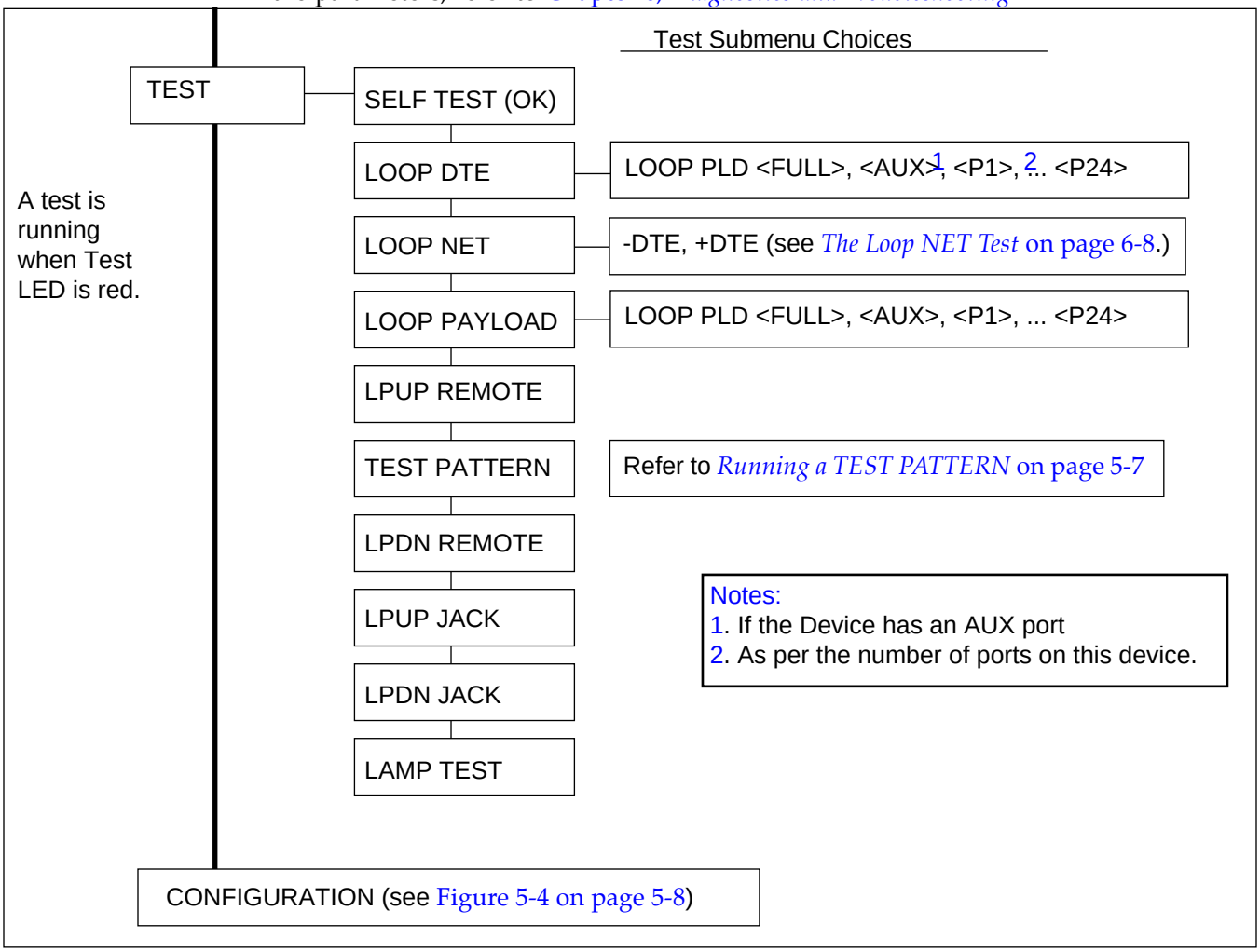
Test Submenu Choices
TEST
A test is running when Test LED is red.
SELF TEST (OK)
LOOP DTE
LOOP PLD <FULL>, <AUX>[1], <P1>, ... <P24>[2]
LOOP NET
-DTE, +DTE (see The Loop NET Test on page 6-8.)
LOOP PAYLOAD
LOOP PLD <FULL>, <AUX>, <P1>, ... <P24>
LPUP REMOTE
TEST PATTERN
Refer to Running a TEST PATTERN on page 5-7
LPDN REMOTE
LPUP JACK
LPDN JACK
LAMP TEST
Notes:
1. If the Device has an AUX port
2. As per the number of ports on this device.
CONFIGURATION (see Figure 5-4 on page 5-8)

Figure 5-3 The Front Panel Menu Tree, TEST

Running a TEST PATTERN

Also refer to *Running the Pattern Test* on page 6-25.

To run TEST PATTERN:

1. **Select TEST PATTERN and press ENTER to access the patterns submenu.**
2. **Press ENTER to open the TEST PTRN <P1 ... P24, AUX, or FULL> submenu.**
3. **Select the pattern (use the up or down keys).**
4. **Press ENTER to start the test.**
5. **Press ENTER again at the system prompt to confirm this test.**

   The DSU/CSU responds with the message:

   ```
   PATTRN SEARCHING
   ```

   The DSU/CSU sends the chosen pattern and attempt to synchronize with the same pattern returning from the remote DSU/CSU.

   When the local DSU/CSU achieves a signal lock from the remote DSU/CSU, it displays:

   ```
   PATTRN 0
   ```

   When it detects errors in the received pattern, it displays the number of received errors. The error count starts at 0 and can reach a ceiling of 65,535. If the pattern lock is lost the DSU/CSU resumes searching.

Configuration Submenus

Figure 5-4, and Figure 5-5 show the CONFIGURATION submenus and related submenus. For more information on the parameters, refer to Chapter 6, *Diagnostics and Troubleshooting*

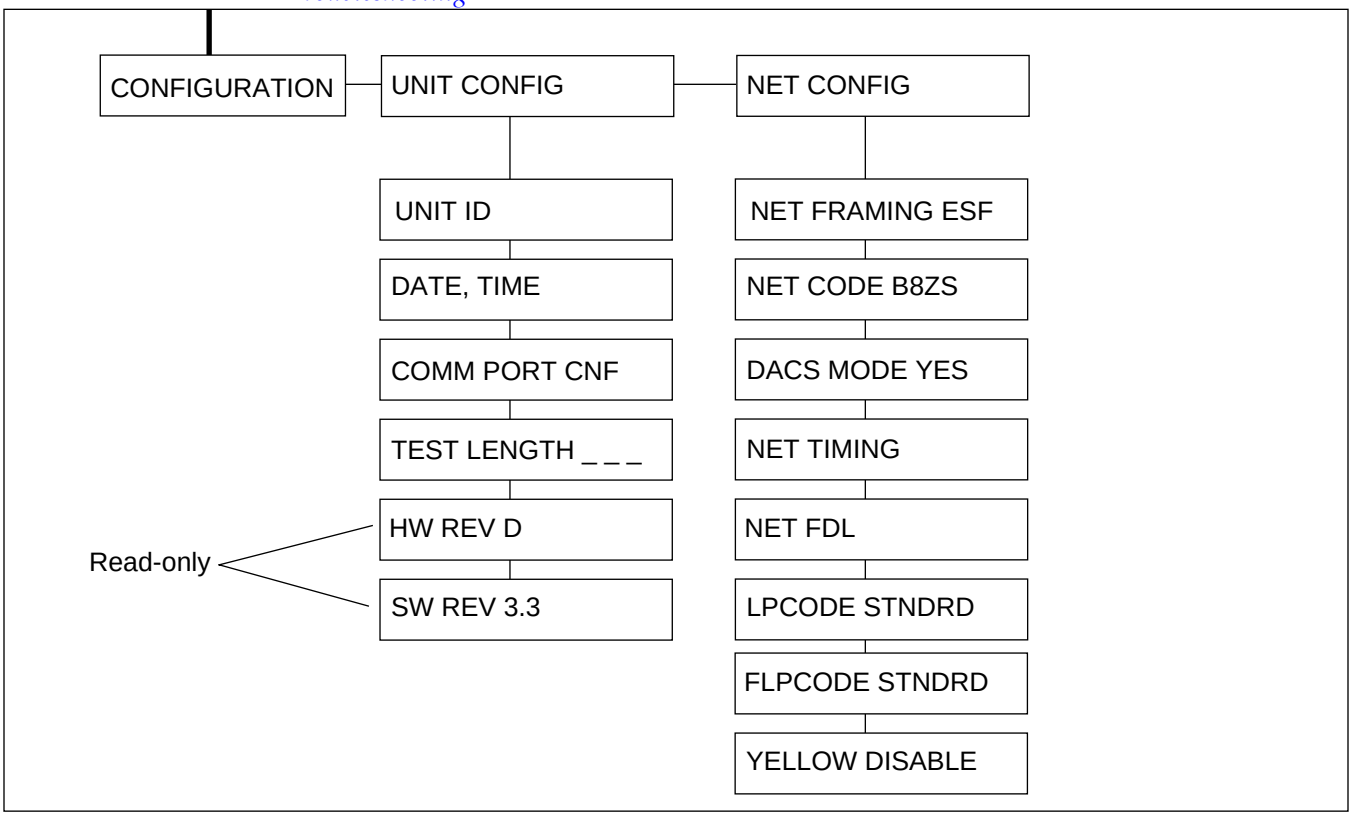

Figure 5-4 The Front Panel Menu Tree, CONFIGURATION

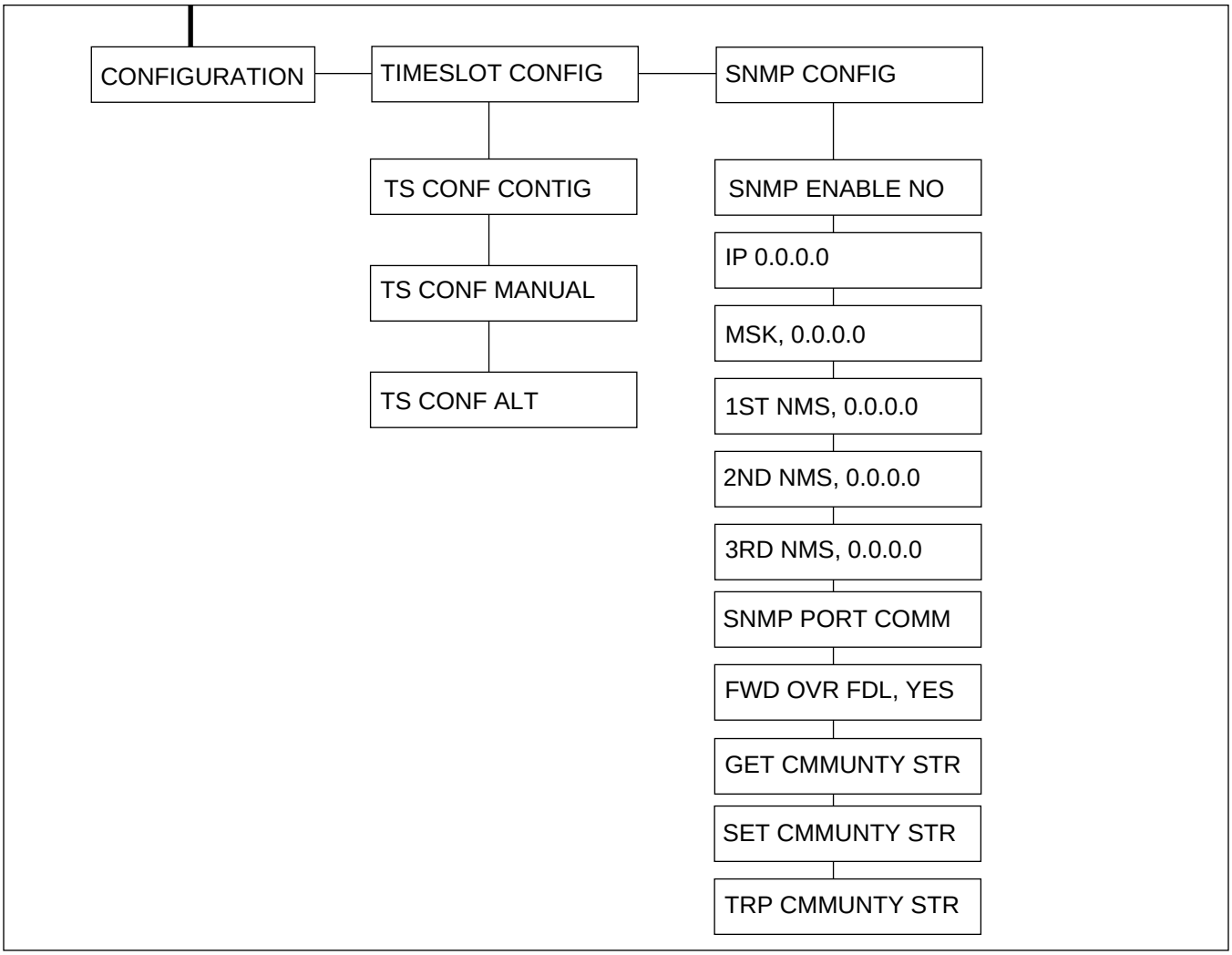

Figure 5-5 The Front Panel Menu Tree, CONFIGURATION (Continued)

The AUX CONFIG Menu

Only when the optional auxiliary DS1 port is in use does t he AUX CONFIG menu appear on the front panel interface (refer to Figure 5-6).

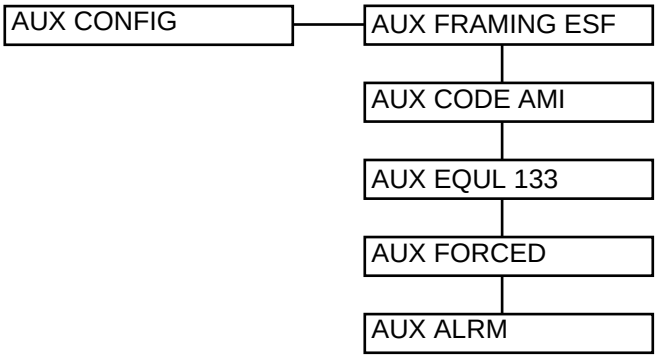

Figure 5-6 AUX CONFIG Submenu, DS1 Port

Refer to *Setting the Auxiliary Port and Network Parameters* on page 3-14 for a description of the auxiliary port parameters.

Preparing for the Initial Configuration

Before you start an initial configuration, have the required information ready and record the configuration.

Required Information

Collect information:

- DSU/CSU IP address and IP subnet mask.

  For establishing a Telnet connection to the DSU/CSU from a remote terminal and enabling SNMP network management capability.

- One to three NMS IP addresses.

  For enabling SNMP network management capability

- Framing and line code requirements.

  As specified in the work order from your service provider

Keep a Record

Keep a written record of each DSU/CSU configuration. Use the Configuration Worksheet provided in Appendix C, *Configuration Worksheet*.

Diagnostics and Troubleshooting

6

To verify your connections and T1 line, run diagnostics from Menu-9 Diagnostics:

- Self test
- Loop DTE test
- Loop NET test
- Loop Payload test
- Loop Up Remote test
- Various Pattern tests
- Loop Down Remote test
- NET/DTE LPBK Test
- Lamp test
- DTE/NET Loopback Test

You can also run these tests from the front panel. Refer to Chapter 5, *The Front Panel*.

NOTE: You do not need to inform the telephone company that you are running the tests. However, if the tests reveal a problem with telephone company service or with the DSU/CSU, you should inform the telephone company that the DTE equipment or the DSU/CSU must be removed from service.

When running a test, you can initiate loopbacks and tests on the full bandwidth, or on the data port fraction. You can also set programmable test patterns.

Adding a Caution Flag

You can add a caution flag to the actions that may disrupt traffic or lose contact with the remote DSU/CSU. The following warning message is prompted if:

- Any change is made to Network DTE or AUX configuration
- The proprietary FDL link to the remote DSU/CSU is up
- The DTE and AUX ports are allocated to some timeslots and both the local and the remote DSU/CSUs are in the same timeslot configuration

When you add a caution flag, the terminal displays:

```
The following change will affect the traffic. To abort type ESC.
Do you want to change the Local, Remote, or Both units [L, R, or B]?
```

NOTE: The caution flag is available only at the terminal.

Testing with Menu-9 Diagnostics

To run a test using Menu-9 Diagnostics (refer to Figure 6-1 on page 6-4):

1. **Select the test in the Test field.**

   In the example, Loop Payload is selected.

2. **Set the Test length, Full Bandwidth Loop Code, Fractional Loop Code and USER1 Pattern and USER2 Pattern.**

   The selections for fractions on which the test is performed are Full Bandwidth, and DATA01. Fraction is ignored with the Self Test, Network Loopback or Lamp test.

3. **To start the test, press s , then y to confirm (or press any other key to cancel).**

   The test results are displayed in the upper half of the screen.

4. **To end the test, press e, then y to confirm (or any other key to leave the test running).**

5. **To clear the pattern error counter, press c , then y to confirm (or any other key to cancel).**

When running a test, you can:

- Initiate loopbacks and tests on the full bandwidth, or on the data port fraction
- Set programmable test patterns

The data appearing in the menu for user-selectable pattern tests is not in “real time” and may be different if you are logged on to the remote DSU/CSU.

The data appearing in the menu for the Test Status is in “real time.”

You may inject a single bit error when the DSU/CSU is sending a test pattern.

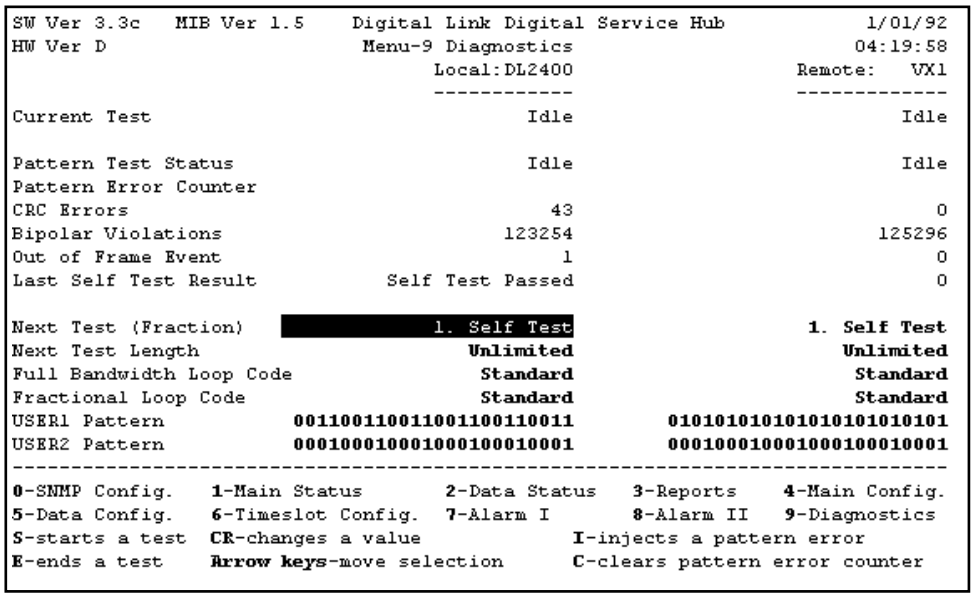
SW Ver 3.3c MIB Ver 1.5 Digital Link Digital Service Hub 1/01/92
HW Ver D Menu-9 Diagnostics 04:19:58
Local:DL2400 Remote: VX1
Current Test Idle Idle
Pattern Test Status Idle Idle
Pattern Error Counter
CRC Errors 43 0
Bipolar Violations 123254 125296
Out of Frame Event 1 0
Last Self Test Result Self Test Passed 0
Next Test (Fraction) 1. Self Test 1. Self Test
Next Test Length Unlimited Unlimited
Full Bandwidth Loop Code Standard Standard
Fractional Loop Code Standard Standard
USER1 Pattern 001100110011001100110011 010101010101010101010101
USER2 Pattern 000100010001000100010001 000100010001000100010001
0-SNMP Config. 1-Main Status 2-Data Status 3-Reports 4-Main Config.
5-Data Config. 6-Timeslot Config. 7-Alarm I 8-Alarm II 9-Diagnostics
S-starts a test CR-changes a value I-injects a pattern error
E-ends a test Arrow keys-move selection C-clears pattern error counter

Figure 6-1 Menu-9 Diagnostics with Loop Payload Test Selected

Menu-9 Diagnostics Parameters

The parameters and options in the upper test status section of Menu-9 Diagnostics are:

Table 6-1 Current Test

Idle	**Self Test**
DTE Loopback (fraction)	LP DN Remote fraction)
NET Loopback (FULL)	LP UP Remote (fraction)
PLD Loopback (fraction)	Lamp Test
DTE/NET Loopback	

Table 6-1 Current Test

Idle	Self Test
Send All 1s (fraction)	Send All 0s (fraction)
Smart Jack Set	Smart Jack Reset
Send 1:1 (fraction)	Send 1:2 (fraction)
Send 1:4 (fraction)	Send 1:7 (fraction)
Send 3:24 (fraction)	Send User 1 (fraction)
Send User 2(fraction)	Send QRW (fraction)

- Pattern Test Status

  Idle, Searching, Locked, Relocked

  Locked Seconds is displayed if the current pattern test is locked. The Locked Seconds is a 16-bit counter which is reset to 0 if the current pattern is unlocked. The counter label will change to Relocked Seconds if the current pattern is unlocked and then relocked.

- Pattern Error Counter

  Error count

  The parameters and options in the user selectable portion of Menu-9 Diagnostics are

- CRC Errors

  Error count, (N/A if RC4 is not enabled)

- Bipolar Violations

  Error count

- Out of Frame Events (OOF)

  Error count

- Last Self Test Result

  Self Test Passed

  Error nn (1 to 5)

Next Test (fraction)

Table 6-2 Next Test (Fraction)

Self Test	**1:1 Pattern**	**QRW Pattern**
Loop DTE	1:2 Pattern	USER 1 Pattern
Loop NET	1:4 Pattern	USER 2 Pattern
DTE/NET loopback	1:7 Pattern	Smart Jack Set
Loop Payload	3:24 Pattern	Smart Jack Reset
Loop Up Remote	All 0 Pattern	
Loop Down Remote	All 1 Pattern	
Lamp Test		

- Next Test Length

  15 min, 1 min, 60 min, Unlimited
  With the Self Test, Loop Up Remote and Loop Down Remote, this parameter does not apply.

- Full Bandwidth Loop Code

  Standard, Alternate, Disabled

- Fractional Loop Code

  Standard, Alternate, Disabled, V.54

- USER 1 Pattern and USER 2 Pattern

  Enter any sequence of 1s and 0s, between 1 and 24 characters in length. With D4 framing, make sure your pattern meets ones density requirements.

The Self Test

The Self Test checks the DSU/CSU electronic components and performs a signal path check of transmit and receive directions utilizing a simulated 4000 foot T1 line.

The possible messages are RUNNINGSELF TEST, SELF TEST PASSED or ERROR <N>.

Table 6-3 Self Test Error Indicators

Test	Description
0	ROM Checksum test failed
1	RAM test failed
2	EEPROM Checksum test failed
3	DTE test failed
4	Pattern test failed
5	Flash Proms Checksum test failed

The Loop DTE Test

The Loop DTE test verifies the operation of the DSU/CSU and the associated DTE cabling and equipment.

The DTE full bandwidth loopback loops the T1 network transmit signal through a 4000 foot simulated line to the DSU/CSU network receive circuitry.

The DTE equipment should receive the same signal it transmitted. The T1 network transmitter continues to transmit toward the network while the DSU/CSU is in DTE loopback.

T1 transmission is interrupted during this test.

NOTE: The DTE device must be able to recognize its own test pattern for Loop DTE to verify the DTE cabling and equipment. Without this capability, the Loop DTE test can verify only the DSU/CSU.

NOTE: You do not need to inform the carrier company before you run this test. However, if the test results indicate a phone company problem, you should inform the company, or require the DSU/CSU to be removed from service.

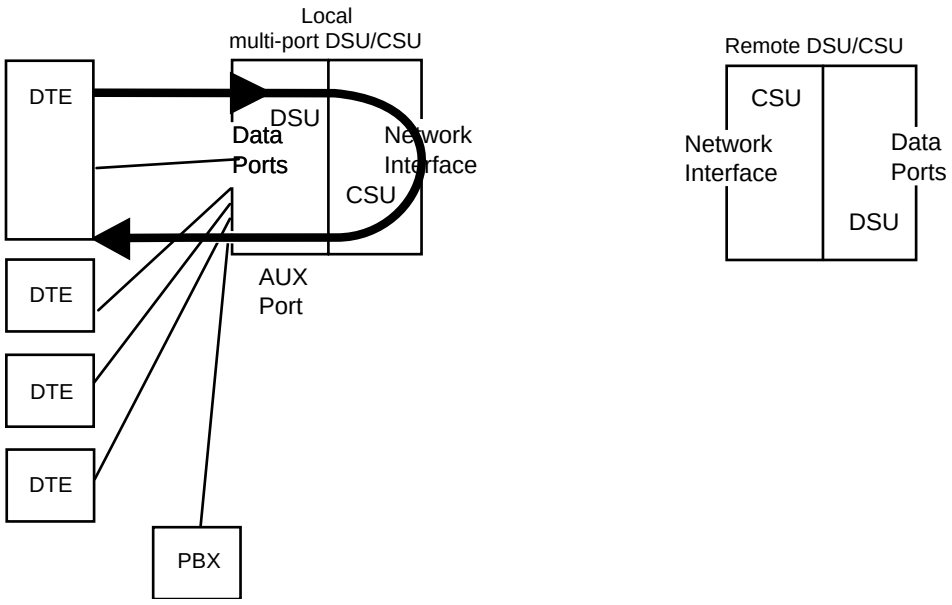

Figure 6-2 Loop DTE Test

The Loop NET Test

The Loop NET test, available only on full bandwidth, verifies the operation of the T1 network. Also available is a Loop DTE/NET test that combines the Loop DTE and the Loop NET tests.

It loops the data received from the T1 network back to the network. The data is regenerated before it is looped back, however, the DSU/CSU does not perform additional processing of the data.

This minimizes the impact of the DSU/CSU during the test so that network problems can be isolated.

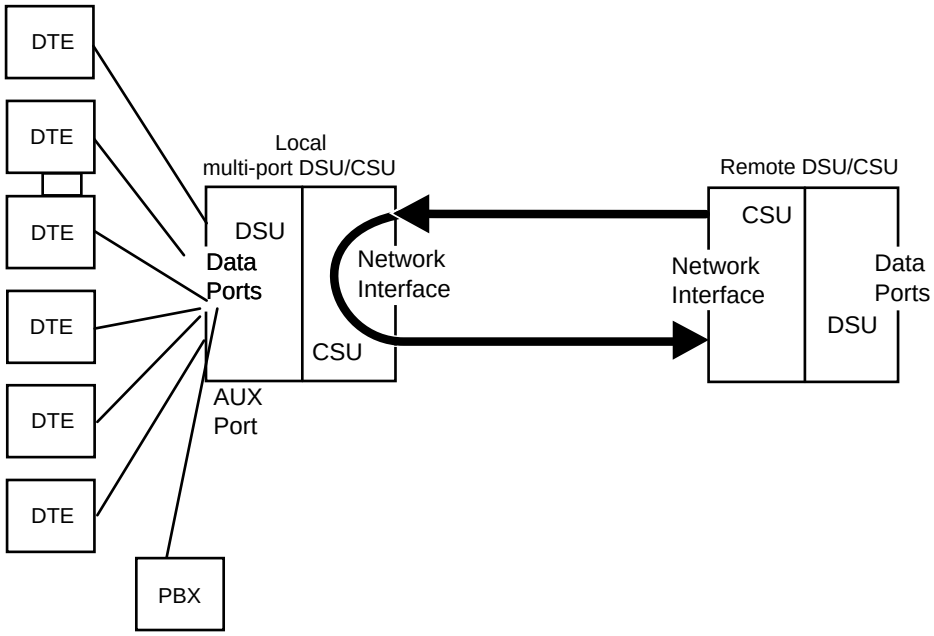

Figure 6-3 Loop NET Test

The Loop Payload Test

The Loop Payload test verifies proper operation of the DSU/CSU and the T1 network.

It loops the payload data received from the T1 network back toward the network. Before it is looped back, the data is regenerated and a new framing pattern is inserted. Thus, the proper T1 framing of the DSU/CSU and network can be verified.

The individual channel Loop Payload loops a selected “fraction” of the T1 signal toward the network. In this mode, the selected data is corrected for BPV, CRC and framing errors, and the FDL is regenerated before the data is looped back to the network.

Receive and transmit clocks and data are suppressed toward the V.35 port on the DTE channels. Payload service to ports not in loopback is not affected.

The DTE/NET Test

The Loop DTE/NET test combines the Loop DTE on full bandwidth, and the Loop NET tests.

Running Multiple Payload Tests

To run multiple loopbacks the device must have more than two DTE ports. You can run multiple Loop Payload tests simultaneously from Menu-9 or SNMP but not from the front panel interface. You can run multiple fractional loop payload tests by sending fractional loop codes from the remote DSU/CSU via SNMP, DLMS, a terminal, or from the front panel interface.

NOTE: To run multiple fractional loop payload tests, you must first terminate any current tests (other than a fractional payload test).

(This feature in not available on the VX Encore.)

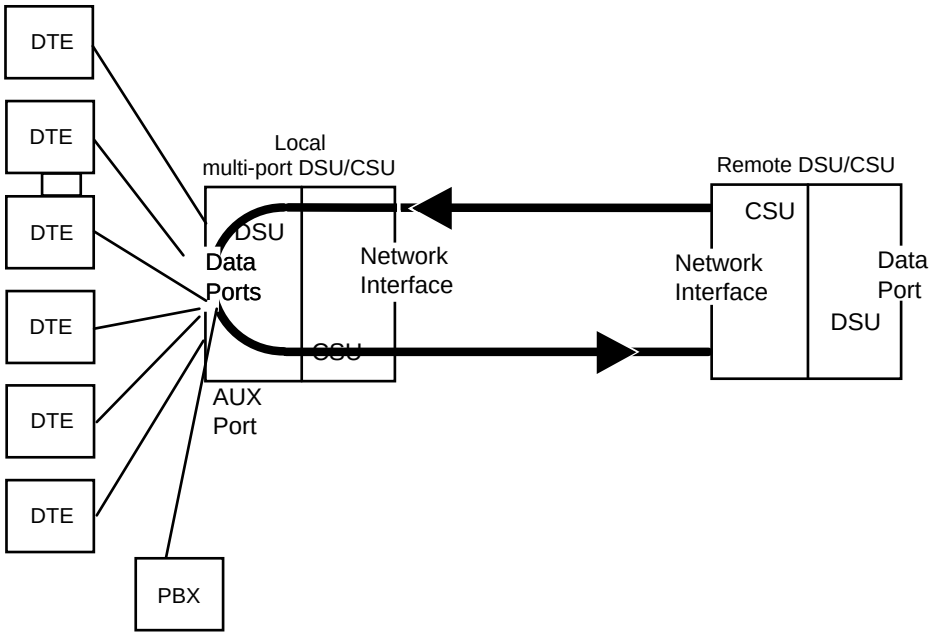

Figure 6-4 Loop Payload Test

The Loop Up Remote Test

The Loop Up Remote test puts the remote DSU/CSU into Network Loopback using the industry standard set codes. Once in Loop Up Remote, test patterns can be sent to verify the Bit Error Rate (BER) performance of the bidirectional T1 network signal.

To put the remote DSU/CSU into network loopback, the local DSU/CSU momentarily transmits the industry standard loop up code to the remote DSU/CSU. If the remote DSU/CSU does not go into network loopback within 15 seconds, a failure is declared and the DSU/CSU stops sending the loop up code.

The loop code and network parameters for the local and remote DSU/CSUs must match.

Use the Loop Down Remote test to terminate the remote loopback.

You can run the Loop Up Remote and Loop Down Remote tests from the front panel. Refer to Chapter 5, *The Front Panel*.

NOTE: The full bandwidth loop up code puts the remote DSU/CSU in a full bandwidth network loopback. The fractional loop up code puts the DSU/CSU in a fractional (per individual port) payload loopback.

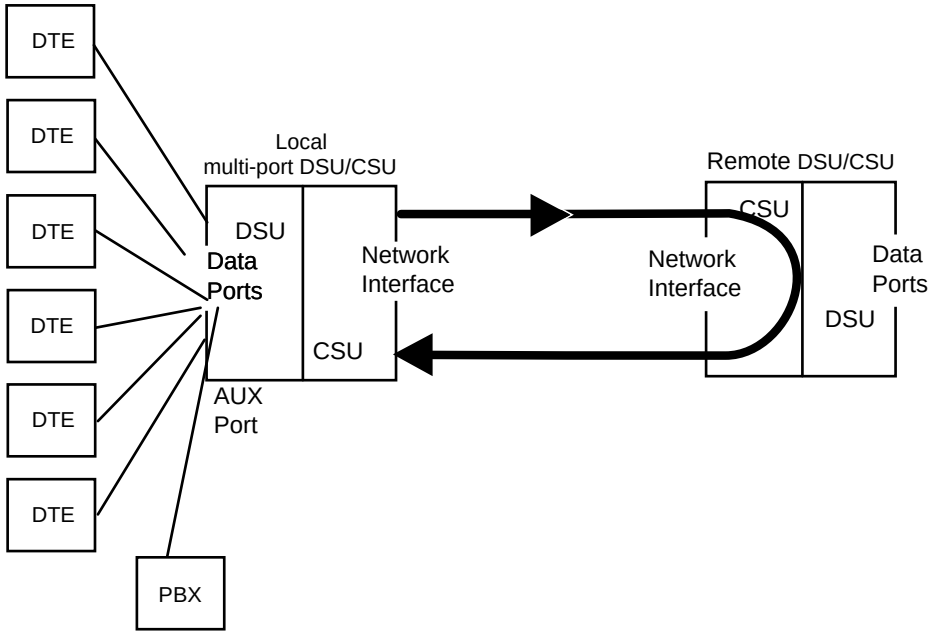

Figure 6-5 Loop Up Remote Test

The Pattern Tests

The QRW Pattern Test

QRW is a pseudo random signal which may catch problems not exposed by other test patterns. The DSU/CSU transmits a QRW pattern to the T1 network, the remote system loops it back to the DSU/CSU which monitors the signal for QRW bit errors.

You can also use the QRW code to isolate a T1 network problem to a specific transmission direction. In this case, both T1 transmission directions are monitored when the local and the remote system transmit QRW (the remote is not put into loopback).

This test is available on any port in any fraction.

The Send 1:7 Pattern Test

This pattern stresses the timing recovery circuits of repeaters and other intermediate equipment.

The Send 3:24 Pattern Test

This pattern tests for ones density (consecutive zeros) tolerance on AMI lines.

The Send 1:1 Test

This pattern sends alternate ones and zeros. It is used to test for bridge taps.

The Send All Ones Test

This pattern is used for signal power measurements. All Ones simulates the highest spectral components and the highest energy out of the DSU/CSU and out of the line repeaters on the T1 line.

The Send All Zeroes Test

This pattern is used to check the correct operation of the B8ZS (T1) line coding. This code is meant to allow a pattern with many 0 bits to go through the line transparently.

The Send 1:4 (or alternate) Test

The 1:4 code is the standard loop up remote code. It is typically used when the loop up remote test fails to put the remote system into loopback. You can determine if the failure is an intermittent or a hard failure by continuously sending the 1:4 code, and monitoring the network status to see if the pattern is being received.

The selections are available on the full bandwidth and on the data ports

The full bandwidth code puts the remote system into full network loopback. When used on a data port, the code puts the corresponding remote port into Loop Payload.

NOTE: If the Loop Up Remote test fails to place the remote system into loopback, check that the Loop Code and Network Framing parameters are the same at each end of the link.

The Send 1:2 Test

The 1:2 code is the standard loop down remote code. Use it when the Loop Down Remote test fails to terminate the remote loopback.

You can determine if the failure is an intermittent or hard failure by continuously sending the 1:2 and monitoring the network status to see if the pattern is being received.

The selections are available on the full bandwidth and on Data Port 1. The full bandwidth code takes the remote system out of full network loopback. When used on Data Port 1, the code takes the corresponding remote port out of Loop Payload.

The User 1 Pattern and User 2 Pattern Tests

These two user programmable (up to 24 characters) patterns enable you to generate a test pattern rather than use pre-programmed patterns or live traffic.

The Lamp Test

Use this test to verify the LEDs. During the test, all LEDs on the front panel illuminate.

Troubleshooting Multi-port DSU/CSU Problems

The remainder of this chapter discusses problems and possible solutions.

Tables list problems and the page number in which to resolve the problem:

- Table 6-4 on page 6-16
- Table 6-5 on page 6-22
- Table 6-6 on page 6-24

Required Tools

You need the following tools and equipment to isolate the DSU/CSU from the network:

- A standard T1 test set, such as a T-Berd 211 or equivalent.
- A DA-15 male connector with two patch cords for connecting to the T1 test set.
- Terminate the patch cords on pins 3 and 11 for the receive pair, on pins 1 and 9 for the transmit pair.
- In lieu of this test set, a T1 loopback plug for isolating the DSU/CSU.
- Connect pins 1 and 3, and pins 9 and 11 to construct a T1 loopback plug.
- A standard data test set, such as a Fireberd 6000 with a V.35/RS449 interface and cables.
- Hand tools for screwing and unscrewing cables.

Table 6-4 Troubleshooting Multi-port Problems

Problem Description and Location
The DSU/CSU does not Power Up on page 6-16
The DSU/CSU System does not Dial Out when an Alarm Occurs on page 6-17
There is no FDL Communication with the Remote/far End System on page 6-17
The ESF User Registers do not Clear from the Network Carrier on page 6-17
Current Tests Terminate without your Intervention on page 6-18
The System Cannot be put into Network Loopback from the Carrier on page 6-18
The System cannot be Put into Payload Loopback from the Network on page 6-18
The NET LED does not Illuminate on page 6-19
The NET LED is Constantly Red on page 6-19
The NET LED Remains Constant Amber/yellow on page 6-19
The NET LED Flickers Intermittently between Red, Amber, and Green on page 6-20
The Data Port TD/RD LEDs do not Illuminate on page 6-20
The Data Port RTS/CTS LEDs do not Illuminate on page 6-21
The DTE Device Shows Intermittent Errors on page 6-21
LEDs do not Illuminate on page 6-22
After Powerup, the Menu Clock no Longer Shows Correct Time or Date on page 6-22

The DSU/CSU does not Power Up

- Make sure the DSU/CSU is plugged in to a live AC outlet, if it is AC powered. If it is DC powered, make sure the respective DC leads are not crossed.

- Check all fuses for opens and replace as needed. If the DSU/CSU blows fuses continuously, call Digital Link technical support.

The DSU/CSU System does not Dial Out when an Alarm Occurs

- Make sure the connection between the Comm Port and the modem is a crossover (null) modem connection.
- A DCE port is represented the same way as the modem port.
- Make sure Connection is set to Modem and two valid telephone numbers are set in Phone Number 1 and Phone Number 2 in Menu 8 Alarm II.
- Make sure Block all Alarms is set to No in Menu-7 Alarm and the occurring alarm is set to Enabled.
- If the above steps do not correct the problem, call Digital Link technical support for assistance.

There is no FDL Communication with the Remote/far End System

- Make sure the DSU/CSU is configured for ESF framing and the Digital Link FDL protocol is enabled in the Menu-4 Main Configuration menu. FDL communications do not exist in D4 framing.
- Make sure you have no DACS devices between your local and remote DSU/CSUs. If a DACS device is in your T1 circuit, you will not have FDL communication (regardless of your framing format).
- If the above steps fail to solve the problem, call Digital Link technical support for assistance.

The ESF User Registers do not Clear from the Network Carrier

- Make sure the ANSI FDL protocol is set to Enabled in the Menu-4 Main Configuration menu.

- Make sure the network carrier is using the ANSI T1.403 or AT&T TR54016 protocol. The system does not respond to any other ESF protocols.
- If the above steps fail to solve the problem, call Digital Link technical support for assistance.

Current Tests Terminate without your Intervention

- Make sure the system is set to run the test for an unlimited amount of time.

  Test length options are 15 min., 1 min., 60 min., Unlimited.
  With Self Test, Loop Up Remote and Loop Down Remote, Unlimited does not apply.
- If the above step does not correct the problem, call Digital Link technical support for assistance.

The System Cannot be put into Network Loopback from the Carrier

- Make sure the network carrier is sending a standard framed network loop up code of 10000 to the system.
- Make sure the system is set to receive the same standard or alternate code as the network.
- Using your T1 test set, send a loop up code into the system. If the system still does not loop up, call Digital Link technical support for assistance.

The System cannot be Put into Payload Loopback from the Network

- Make sure the system is set for V.54 fractional loopback code, if the network is sending V.54 to loop it up.
- Make sure the payload portion you are attempting to loop up has assigned bandwidth.
- If the DSU/CSU still does not loop up, use your T1 test set to inject a fractional loopback signal on the channels you want to test.
- If the above steps fail, call Digital Link technical support for assistance.

The NET LED does not Illuminate

- Run a lamp test from Menu-9 Diagnostics to make sure the LEDs are working.
- Make sure the T1 line from your service provider is connected to the DA-15 female connector on the back of the DSU/CSU.
- Remove the T1 line from the back of the DSU/CSU and place the T1 test set in its place. Connect the transmit of the T1 test set to the receive of the network plug (pins 3 and 11, 3—tip, 11—ring). If the NET LED changes to any color, i.e., green or red, contact your service provider for assistance with cutting over the T1 line.

  If the NET LED does not light, place the T1 loopback plug on the network connector on the back of the DSU/CSU. If it then changes color, troubleshoot your test setup.

- If the NET LED never lights, call Digital Link technical support for assistance.

The NET LED is Constantly Red

- Make sure the T1 line framing and coding formats match the DSU/CSU's framing and coding formats.
- Check the DSU/CSU for excessive errors.

  In ESF mode, check for CRC and BPVs; in D4 mode check for BPVs only. If excessive errors appear, place your T1 test set or your loopback plug on the DA-15 female connector on the back of the system to see if the errors stop.

  If they do, contact your service provider for assistance.

  If the errors do not stop, call Digital Link technical support for assistance.

The NET LED Remains Constant Amber/yellow

- Check to see if the DSU/CSU is receiving a yellow or AIS (blue) alarm.
- Make sure the remote/far end system is receiving a proper T1 signal. If it is not, it will be generating a yellow alarm towards your equipment.
- If the system is still receiving a yellow alarm, place the T1 test set or the T1 loopback plug on the DA-15 connector on the back of the DSU/CSU. If the yellow alarm stops, contact your service provider for assistance.

- If, after all above steps have been satisfied, your DSU/CSU still shows a yellow NET LED, call Digital Link technical support for assistance.

The NET LED Flickers Intermittently between Red, Amber, and Green

- Make sure the timing source is properly configured. Timing should be set to NETWORK if the network is the source.

  If it is not the source, timing should be set to INTERNAL at one T1 end, and NETWORK at the other end.

  If you're not sure that the network is the source, contact the network provider and discuss your circuit order. The provider will tell you if the T1 network is the source.

- If the timing source is properly configured and the NET LED continues to flicker between red, amber and green, isolate the system with the T1 test set to see if the problem clears.

  Place the T1 test set into the proper timing mode (provide timing or recover timing). You cannot use the loopback plug in this application since it would require us to provide timing and would not allow us to see if we can recover timing from a valid T1 source.

- If the NET LED continues to flicker, call Digital Link technical support for assistance.

The Data Port TD/RD LEDs do not Illuminate

- Make sure the DTE cable is plugged into the appropriate connector on the back of the DSU/CSU. The connectors are labeled port one, port two, etc., depending on your system type.
- Check the timeslot allocation to make sure bandwidth is allocated to the specific data port.
- Run a lamp test from Menu-9 Diagnostics to make sure the LEDs are working.
- Make sure the DTE devices connected physically to the DSU/CSUs are sending data to each other. The serial line will not transmit data or receive data if it is shut down.

- If you have eliminated the above as a cause, place your data test set on the problem port—if the TD/RD LEDs do not light, call Digital Link technical support for assistance.

The Data Port RTS/CTS LEDs do not Illuminate

- If your system does not support the RTS or DTR protocol, set the port DTE loss to None (default—RTS) in Menu-2 Data DTE Configuration menu. See *Configuring the Data Ports* on page 3-19.

  The CTS LED should light and remain lit.

  RTS and DTR are signals sent from the DTE device connected to the Data Port.
- Run a lamp test from Menu-9 Diagnostics to make sure the LEDs are working.
- If the CTS LED still does not illuminate, call Digital Link technical support for assistance.

The DTE Device Shows Intermittent Errors

- If your T1 line is configured for AMI line coding, place the Data Port in the forced operation mode.

  This ensures that your DTE device meets ones density and does not allow errors to be transmitted in place of live data.
- You may have a timing error. Refer to *There is no FDL Communication with the Remote/far End System* on page 6-17.
- If the DTE device is the timing source, set the data port as the source. You need a special DTE cable to enable you to configure the system as a DTE device. Use a cable appropriate to your application (V.35 or RS-449).
- Running a DTE Loopback test is useful here.
- If the cable and the timing are correct, place a data test set at both ends of the T1 line in place of the DTE devices to see if the errors continue. The DTE loopback should be good here.

- If the errors persist, call Digital Link technical support for assistance.

LEDs do not Illuminate

- Run a lamp test from Menu-9 Diagnostics to make sure the LEDs are working.

After Powerup, the Menu Clock no Longer Shows Correct Time or Date

- The menu clock is not a real-time clock. Each time you power up, it is reset to a predetermined value. You must enter the correct time and date in the time and date fields in Menu-4 Main Configuration.

Troubleshooting the Terminal Interface

The Digital Link terminal interface is designed for simplicity, reliability, and ease of maintenance. However, you may occasionally encounter problems.

Table 6-5 Troubleshooting the Terminal Interface

Problem Description and Location
No Response from any DSU/CSU on the Communication Network on page 6-23
No Response from Some DSU/CSUs on the Network on page 6-23
Invalid Data is Received from One or All DSU/CSUs on the Network on page 6-23
Invalid Data is Received with a Mostly Good Menu Display on page 6-24

No Response from any DSU/CSU on the Communication Network

- Make sure Pin 8, CTS, is not connected at the ASCII terminal end of the Comm Port cable.

  Standard Digital Link Comm Port cables do not have this connection. Some ASCII terminals activate the CTS line and thus interfere with the DSU/CSU collision avoidance.

- Get a null modem adapter to cross pins 2 and 3 (transmit and receive for modems) on the terminal.
- The Comm Port cable is connected to an inactive or faulty port on the terminal, or the terminal is faulty.
- Replace the Comm Port cable if it is faulty.
- Make sure the Comm Port parameters match the terminal's parameters.

No Response from Some DSU/CSUs on the Network

- Make sure the DSU/CSU is powered up.
- Make sure the unit ID is correct.
- Swap the connector positions with a DSU/CSU that has no problem communicating with the terminal, to find out if a portion of the Comm Port cable is faulty.
- Make sure the Comm Port parameters match the terminal's parameters.

Invalid Data is Received from One or All DSU/CSUs on the Network

- Make sure the Comm Port parameters (on the problem DSU/CSUs) match the parameters of the terminal.
- Verify that none of the DSU/CSUs are missing an ID and that no two DSU/CSUs have the same unit ID.
- Verify a DSU/CSU that is not in DLMS or SNMP mode.

Invalid Data is Received with a Mostly Good Menu Display

- Reduce the baud rate on the DSU/CSUs and terminal if you are using the maximum (9600 baud) for communicating with a very large number of DSU/CSUs.
- If the cable from the network to the terminal exceeds the 50 ft. maximum, fix the length.
- Verify that none of the DSU/CSUs are missing an ID and that no two DSU/CSUs have the same unit ID.

Additional Troubleshooting Tips

If you do not have any test equipment, you must rely on the network to do most of the troubleshooting for you. You can run several tests from your system's internal diagnostics.

Table 6-6 Additional Troubleshooting Techniques

Problem Description and Location
Running Loopbacks on page 6-24
Running the Pattern Test on page 6-25

Running Loopbacks

Running a loopback test enables you to isolate sections of the DSU/CSU to determine if the DSU/CSU is defective or, in some cases, other outside forces are at work.

No test is 100-percent complete and a small portion of the DSU/CSU remains untested. The DSU/CSU may allow only one active loopback at a time.

- Network loopback

  If you suspect that the DSU/CSU is defective, manually place the DSU/CSU in a network loopback to isolate it from the rest of the equipment. The DSU/CSU loops the T1 signal as soon as it arrives and sends it back to the carrier.

  Run this test from a local terminal. You can also run the Loop Up Remote and Loop Down Remote tests from the front panel.

- DTE loopback

  To verify that your DTE device is able to send and receive signals, manually place the system in a DTE loopback. The loopback brings in the DTE signal, runs it through the system, and loops it back to the DTE device before sending it to the network. Do not run this test if your DTE device is not able to accept its own signal.

Running the Pattern Test

To test the T1 circuit between two DSU/CSUs, generate a variety of data patterns across the T1 circuit from the DSU/CSU.

- Make sure both ends of the T1 circuit are generating the same pattern i.e., QRW, or 3 in 24.
- The test is successful if you have pattern sync and no errors. This test is also useful if you suspect that your DTE device is sending data with errors.
- To ensure that data is sent only from the DSU/CSU, the DTE device is not allowed to pass data to the network during the test.

Technical Specifications

A

Network Interface

Table A-1 Network Interface

Item	Specification
Receive line rate	1.544Mb/s ±50bp/s
Line code	AMI, B8ZS
Framing	D4, ESF
ESF FDL	AT&T TR54016-1986, AT&T TR54016-1989, ANSI T1.403-1989
Input signal	DSX-1, -24dB0
Output signal	0, -7.5dB or -15dB LBO
Pulse density	AT&T TR62411, HDLC inversion, deferred, B7 stuffing, forced, AT&T TR54019A, FCC Part 68

Data Interface

Table A-2 Data Interface

Item	Specification
Interface types	V.35, RS-449/EIA-530
Data rates	N x 56Kb/s & 64Kb/s (N = 1 through 24)
Number of data ports	VX Encore—2, DL100 Encore—2, 4, 6 DL1200 Encore— 12, DL2400 Encore—24

A

DS1 Interface

Table A-3 DS1 Interface

Item	Specification
Line Rate	N x 56Kb/s & 64Kb/s (N = 1 through 24) ±50b/s
Line Rate	N x 56Kb/s & 64Kb/s (N = 1 through 24) ±50b/s
Line code	AMI, B8ZS
Framing	D4, ESF
Equalization	0-655 feet to DSX-point

System Timing

Internal, network, DS1 port, data port

External (N x 56Kb/s & 64Kb/s (N = 1 through 24)) or 1544Kb/s

Stratum 4 support

SNMP

Full embedded SNMP agent based on SNMP v1, supporting RFC 1213, RFC 1406, MIB II, Enterprise MIB

Front Panel

Table A-4 Front Panel

Item	Specification
Display	16 character alphanumeric
Key pad	4 keys
LEDs (per data port)	TD, RD, CTS, RTS, DTR, DATA/TEST
Status	Network port
AUX (DSX1) Port	
Test	
Bantam jacks	T1 Send (IN/MON)
T1 Receive (OUT)	

Power Options

Table A-5 Power Options

Item		Specification
AC input voltage		110 VAC (for DL100 Encore, DL1200 and DL2400)
DC input voltage		-48 VDC
Power consumption		
	VX Encore	10W maximum
	DL100 Encore	40W maximum
	DL1200 Encore	60W maximum
	DL2400 Encore	60W maximum

A

Alarm Contacts

Table A-6 Alarm Contacts

Item	Specification
Input	Form C dry contacts, NO or NC
	Activated by application of 20 and to 50 volts
Output	Form A dry contacts, NO or NC

Environmental

Table A-7 Environmental

Item	Specification
Operating temperature	0 to 50 °C
Storage temperature	-20 to +60 °C
Relative humidity	0 to 95% non-condensing
Altitude	15,000 ft. AMSL

Table A-8 Mechanical

Item	Specification
VX Encore	17.2"W x 11.75"D x 1.75"H
DL100 Encore	17.2"W x 11.75"D x 2.5"H
DL1200/2400	17.2"W x 11.75"D x 4.82"H

Table A-8 Mechanical *(Continued)*

Item	Specification
Comm Port	DC-9 socket
Network Connector	DA-15 socket
DTE connector	DB-25 socket
DS1 connector	DA-15 socket
External clock	BNC, 50 ohm, unipolar signal, Stratum 4, 56 Kbp/s-1.544 Mbp/s
	minimum voltage—2.4 VDC peak to peak
	maximum voltage—5.0 VDC peak to peak

Regulatory

UL 1459

UL 1950

FCC Part 68

FCC Part 15 Class A

CUL (CSA)

DOC (IC)

ESD Standard compliance: C62.41-1980

Table A-9 Diagnostics

Item	Specification
Loopbacks	T1 Network, T1 Payload, Multiple T1 Payload, DTE, Fractional T1 Payload, Fractional DTE
T1 Loopback control	T1 Set/Reset code, ESF FDL commands, Front Panel, Comm Port
Fractional Payload	
Loopback control	CCITT V.54 Sequence, Front Panel, Comm Port
Test patterns	QRW, 1-in-1, 1-in-7, 3-in-24, All 1s, All 0s, 2-User Programmable 24 Bit Patterns, Smart Jack Set /Reset
Alarm parameters	
T1 network port	NET Carrier Loss
	NET Sync Loss
	NET AIS Received
	NET Yellow Received
	CRC, BPV, OOF Threshold
Data port	RTS Loss
	DTR Loss
DS1 port	DS1 Signal Loss
	DS1 Sync Loss
	DS1 AIS Received
	DS1 Yellow Received

Reliability and Equipment Life

Table A-10 Reliability and Equipment Life

Equipment	MTBF
VX Encore without DS1 port	9.1 years
VX Encore with DS1 port	8.9 years
DL100 Encore with 2 data ports	7.6 years
DL100 Encore with 4 data ports	6.2 years
DL100 Encore with 6 data ports	5.3 years
DL1200 Encore	3.37 years
DL2400 Encore	2.2 years

Front Panel LEDs

The LEDs on the DSU/CSU front panel show the status of the data port, network port and diagnostic tests.

The example in Figure A-1 shows the front panel LEDs on a VX Encore.

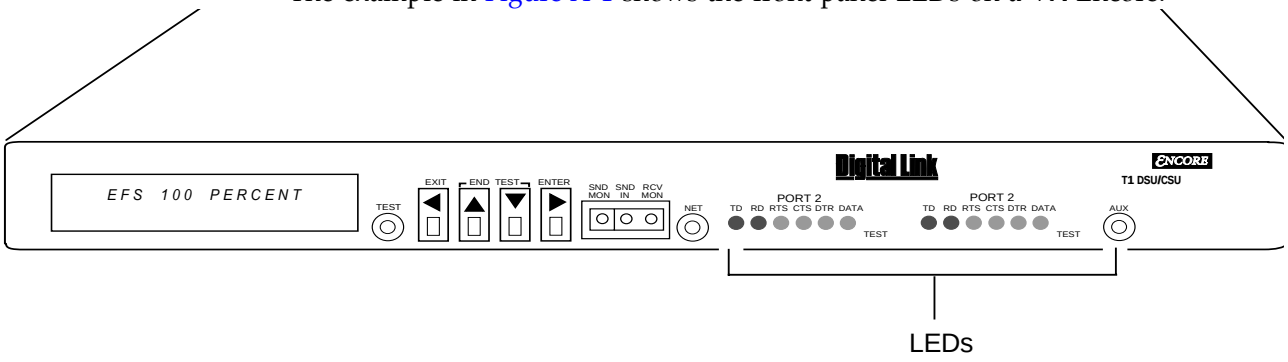

Figure A-1 VX Encore Front Panel

Table A-11 Front Panel LEDs

Item	LED	Description
TEST	Solid green Solid red Blinking yellow Solid yellow OFF	Power is on; unit has passed Self Test. Power is on; Self Test failed. Red LED remains on for 10 seconds, then turns green. Power is on; Self Test running. Power is on; test other than Self Test running. Power is off
NET	Solid green Solid red Blinking red/grn Solid yellow OFF	Signal from network is good. Unit cannot synchronize to network frame. DSU/CSU is receiving frame errors or illegal BPVs from network. DSU/CSU is detecting CMI, OOS or OOF signal from network. No signal coming from network.

Table A-11 Front Panel LEDs *(Continued)*

Item	LED	Description
PORT 1 and PORT 2		
TD	Green OFF	DTE transmitting pulses; DSU/CSU detecting pulses (1s) from DTE. DSU/CSU not detecting pulses from DTE or no DTE connected to data port.
RD	Green OFF	DTE receiving pulses from DSU/CSU. DTE receiving no pulses from DSU/CSU.
RTS	Yellow OFF	RTS line from DTE asserted. RTS line from DTE not asserted.
CTS	Yellow OFF	CTS line to DTE asserted. CTS line to DTE not asserted
DTR	Yellow OFF	DTR line from DTE is asserted. DTR line from DTE not asserted.
DATA/TEST	Yellow OFF	DTR line from DTE is asserted. DTR line from DTE not asserted.
AUX	Solid green OFF	Ancillary equipment or PBX transmitting or detecting pulses. Ancillary equipment or PBX not transmitting or detecting pulses.

Front Panel Test Jacks

The three monitor jacks on the front panel enable you to test the T1 line without disrupting the equipment using T1 test equipment.

The three monitor jacks are SND MON, SND IN, and RCV MON.

Table A-12 Monitor Jacks.

Item	Meaning	Description
SND MON	Send Monitor	The test equipment monitors the signal sent to the T1 line. Non-intrusive
SND IN	Send In	The test equipment injects data into the T1 line. Intrusive.
RCV MON	Receive Monitor	The test equipment monitors the signal received from the T1 network. Non-intrusive.

Comm Port Parameters

Table A-13 Comm Port Parameters

Parameter	Option
Baud rate	300, 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400
Parity	Even, Odd and None
Word length	7 or 8
Comm Port DCD	ON
XOFF Until ON	XOFF Until ANY, XOFF Until XON

Equipment Grounding Conductor

The equipment grounding conductor or cable is connected to ground at the service equipment.

It should be installed as part of the circuit supplying the system and should not be smaller in size than the ungrounded branch-circuit supply conductors.

A bare, covered or insulated grounding conductor is acceptable. An individually covered or insulated conductor should have a green, or green with one or more yellow stripes, continuous outer finish.

The attachment-plug receptacle in the vicinity of the system should be of a grounding type and the grounding conductor serving the receptacle should be connected to earth ground at the service equipment.

Multi-port DSU/CSU Model Number

Table A-14 Model Numbers

Item	Description
DL090-P	VX Encore DSU/CSU with SNMP
DL090-P-D	VX Encore DSU/CSU with SNMP with DS1 port
DL100ENC-P-2	DL100 Encore DSU/CSU with SNMP with 2 DTE ports
DL100ENC-P-4	DL100 Encore DSU/CSU with SNMP with 4 DTE ports
DL100ENC-P-6	DL100 Encore DSU/CSU with SNMP with 6 DTE ports
DL1200	DL1200 DSU/CSU
DL2400	Dl2400 DSU/CSU
DTE Cables	**Cable to customer equipment**
DL1301-01	V.35, DB-25 male to M34 socket, 1 ft.
DL1301-10	V.35, DB-25 male to M34 socket, 10 ft.
DL1303-10	RS-449, DB-25 male to DB-37 socket, 10 ft.
Network Cable	
Communications Cables	**Cable to terminal**
DL1082	DC-9 to DC-9, 4 connections
DL1083	DC-9 to DC-9, 8 connections

Factory Default Configuration

Table A-15 Factory Default Configuration

Unit Configuration			
Unit ID	No ID assigned	Protect Mode	Disabled
Yellow Alarm	No		
Network Configuration			
Framing	ESF	Line Code	B8ZS
LBO	0dB	Interface	DACS
Main Synch. Source	Network	Alternate Synch Source	Internal
Digital Link FDL Protocol	Enabled	ANSI FDL Protocol	Enabled
FDL	Block	Aux Port Bit 7 Stuffing	No
AUX Port Configuration			
Aux Framing	ESF	Aux Line Code	V.35
Aux Line Code	B8ZS	Aux Port Bit 7 Stuffing	No
Aux Equalization	0’-133’		
Data Port Configuration			
Code	Normal	Format	V.35
Loss	RTS	Clock	SCTE
Mode	DCE		
Timeslot Allocation			
Allocation Type	Contiguous	All Bandwidth Allocated to	DATA01
Diagnostic Configuration			
User Pattern 1	001100110011001100110011	Full Bandwidth Loop Code	Standard
User Pattern 2	000000010000000100000001	Fractional Bandwidth Loop Code	Standard

Table A-15 Factory Default Configuration *(Continued)*

Alarm Configuration			
Block All Alarms	No	CRC Threshold Alarm	Disabled
BPV Threshold Alarm	Disabled	OOF Threshold Alarm	Disabled
Net Carrier Loss Alarm	Enabled	Net Sync Loss Alarm	Enabled
Net AIS Received Alarm	Enabled	Net Yellow Received Alarm	Enabled
Loss of Signal from data port	Enabled	Report External Alarms	Disabled
External Alarm Input Contacts	Normally Open	External Alarm Output Contacts	Normally Open
External Alarm Input Message	No message	External Alarm Output Indication	No message
SNMP Configuration			
IP Address	0.0.0.0	IP Subnet Mask	0.0.0.0
1st NMS Address	0.0.0.0	2nd NMS Address	0.0.0.0
3rd NMS Address	public	Set Community String	Disabled
Get Community String	Disabled	TRAP Community String	public
Forward over FDL	public	Output Port	Comm
Comm Port and Terminal Configuration			
Connection	Direct	Terminal Mode	Enabled
Timeout when Logged on	Unlimited	Phone Number 2	Not Assigned
Timeout when not Logged on	Unlimited	Phone Number 1	Not Assigned
Comm Port	9600, 8, no parity, 2 stop bits	Normal User Password	Not Assigned
Comm Port DCD	Disabled	Superuser Password	Not Assigned
Comm Port XON/XOFF	(read-only)		

Determining the Distance between the DSU/CSU and the T1 Line Demarcation Point

You need to determine the correct distance between the DSU/CSU and the T1 line demarcation point before you connect the T1 cables.

Calculate the T1 transmission loss at the premises remote-end. Transmission loss is attributed to cable attenuation (signal loss) from the last telephone company repeater to the DSU/CSU network interface. You do the adjustment with the LBO (L3) which you set in Menu-4 Main Configuration.

First loss (L1)	Phone company loss, between 0 and 22 dB, specified by phone company
Second loss (L2)	Cable length loss. Calculate L2 from the distance of the customer premise cabling, approximately 1dB for every 200 feet[1] (cable length/200 =dB loss). Cannot exceed 22.5 dB minus L1
LBO (L3)	DL3900 LBO setting. 15 to 22.5 dB loss required of the premises remote-end section (LBO options—0 dB, 7.5 dB, and 15 dB down.)

1. Actual cable loss depends on the particular cable type and the manufacturer which must meet AT&T specification.

- Calculate the T1 transmission using this formula:

  L1 + L2 + L3 = 15 to 22.5 dB

  The sum of the two losses, L1 and L2, plus any LBO (Line Build Out) must be greater than 15 dB and less than, or equal to, 22.5 dB at 772 kHz.

- Select the required LBO so that: L1 (phone company) + L2 (your loss due to cable length) + L3 (your LBO switch setting) = greater than 15 dB but less than 22.5 dB.

  Example

  L1 = 11 dB (Obtained from phone company)

  L2 = 2 dB (Premises cable length is 400 ft., 1dB per 200 ft.)

  LBO = 7.5 dB selected because:

  11 dB(L1) + 2 dB(L2) + 7.5 dB(L3) = 20.5 dB which is between 15 dB and 22.5 dB, as required.

Connector Pin Assignments

B

T1 Network Port Pin Assignments

Table B-1 DA-15 Network Interface Pin Assignments

Pin	Signal
1	Send toward Network Tip (T1)
9	Send toward Network Ring (R1)
2	Frame Ground
3	Receive from Network Tip (T)
11	Receive from Network Ring (R)
4	Frame Ground
5, 6, 7, 8, 10, 12,13,14,15	N/C

AUX DTE Pin Assignments

Table B-2 DA-15 Auxiliary DS1 Connector Pin Assignments

Pin	Signal
1	Receive from DTE Tip (T1)
9	Receive from DTE Ring (R1)
2	Frame Ground

Table B-2 DA-15 Auxiliary DS1 Connector Pin Assignments

Pin	Signal
3	Send toward DTE Tip (T1)
11	Send toward DTE Ring (R1)
4	Frame Ground
5, 6, 7, 8, 10, 12,13,14,15	N/C

DTE Port Pin Assignments

The pin assignments for the DB-25 DTE connector are listed in the following four tables. Table B-3 and Table B-4 define DTE port configuration.

Table B-3 DB-25 to V.35 DTE Connector Pin Assignments

Twisted Pair	V.35	DB-25
Yellow	T	16
Black	R	3
Brown	S	14
Black	P	2
Black	E	6
Blue	NC	NC
White	H	20
Red	NC	NC
Red	K	18
Green	B	7
Red	D	5
Yellow	NC	NC
Orange	F	8

Table B-3 DB-25 to V.35 DTE Connector Pin Assignments *(Continued)*

Twisted Pair	V.35	DB-25
Red	NC	NC
Black	X	9
Red	V	17
Green	Y	15
Black	AA	12
Blue	U	24
RED	W	11
Blue	C	4
Green	NC	NC
DRAIN	A	

Table B-4 DB-25 to RS-449 DTE Connector Pin Assignments

Twisted Pair	RS-449	DB-25
Blue	17	24
Red	35	11
Blue	7	4
Black	25	19
Yellow	24	16
Black	6	3
Brown	22	14
Black	4	2
Black	11	6

Table B-4 DB-25 to RS-449 DTE Connector Pin Assignments *(Continued)*

Twisted Pair	RS-449	DB-25
Green	18	25
Yellow	27	13
Red	9	5
Orange	13	8
Red	31	10
Black	26	9
Red	8	17
Green	5	15
Black	23	12
Black	19	7
Blue	NC	NC
Drain	1	NC

Communication Port Pin Assignments

Table B-5 describes the Comm Port pin assignments for the Multi-port Encore DSU/CSU.

Table B-5 Communication Port Pin Assignments

Pin	Signal	Description
2	SD	Send Data
7	RTS	Request to Send
3	RD	Receive Data
8[1]	CTS	Clear To Send (I/O to all DSUs only)

Table B-5 Communication Port Pin Assignments

Pin	Signal	Description
5	SG	Signal Ground (bi-directional)
1	DCD	Data Carrier Detect

1. CTS is used by the DSU / CSU as a collision avoidance line. This line should not be connected at the CRT terminal end of the Comm Port cable.

Adapter Pin Assignments

Digital Link provides a DB-25 to DC-9 adapter for the Digital Link DC-9 Comm Port ribbon cable. The pin-out assignments for the adapter are listed below in Table B-6.

Table B-6 DC-9 to DB-25 Adapter Pin-outs

DC-9	DB-25
3	2
2	3
7	4
8	5
6	6
5	7
1	8
9	23
4	21

DTE Clock Rates

Table B-7 lists the DTE clock rates.

Table B-7 DTE Clock Rates

Line Code	Network	DTE Clock Rate
B8ZS	1	1.528 Mb/s
	2	3.056 Mb/s
	3	4.584 Mb/s
	4	6.112 Mb/s
	5	7.640 Mb/s
	6	9.168 Mb/s
	7	10.696 Mb/s
	8	12.224 Mb/s
AMI	1	1.336 Mb/s
	2	2.672 Mb/s
	3	4.008 Mb/s
	4	5.344 Mb/s
	5	6.680 Mb/s
	6	8.016 Mb/s
	7	9.352 Mb/s
	8	10.688 Mb/s

Configuration Worksheet

C

Use this worksheet to keep a written record of your configuration.

Table C-1 Configuration Worksheet

Unit Configuration			
Unit ID	.....	Protect Mode	.....
Yellow Alarm	.....		
Network Configuration			
Framing	.....	Line Code	.....
		Interface (read-only)	.....
LBO	.....		
Main Synch. Source	.....	Alternate Synch. Source	.....
FDL	.....	Aux Port Bit 7 Stuffing	.....
Digital Link FDL Protocol	.....	ANSI FDL Protocol	.....

Table C-1 Configuration Worksheet *(Continued)*

AUX Port Configuration			
Aux Framing	.....	Aux Line Code	.....
Aux Line Code	.....	Aux Port Bit 7 Stuffing	.....
Aux Equalization	.....		
Data Port Configuration			
Code	.....	Format	.....
Loss	.....		
Mode	.....	Clock	.....
Timeslot Allocation			
Allocation Type	.....	All Bandwidth Allocated to	.....
Diagnostic Configuration			
User Pattern 1	.....	Full Bandwidth Loop Code	.....
User Pattern 2	.....	Fractional Bandwidth Loop Code	.....

Table C-1 Configuration Worksheet *(Continued)*

Alarm Configuration

Block All Alarms	.....	CRC Threshold Alarm	.....
BPV Threshold Alarm	.....	OOF Threshold Alarm	.....
Net Carrier Loss Alarm	.....	Net Sync Loss Alarm	.....
Net AIS Received Alarm	.....	Net Yellow Received Alarm	.....
Loss of Signal from data port	.....	Report External Alarms	.....
External Alarm Input Contacts	.....	External Alarm Output Contacts	.....
External Alarm Input Message	.....	External Alarm Output Indication	.....

SNMP Configuration

IP Address	.....	IP Subnet Mask	.....
1st NMS Address	.....	2nd NMS Address	.....
3rd NMS Address	.....	Set Community String	.....
Get Community String	.....	TRAP Community String	.....
Forward over FDL	.....	Output Port	.....

Table C-1 Configuration Worksheet *(Continued)*

Comm Port and Terminal Configuration			
Connection	.....	Terminal Mode	.....
Timeout when Logged on	.....	Phone Number 2	.....
Timeout when not Logged on	.....	Phone Number 1	.....
Comm Port	.....	Normal User Password	.....
Comm Port DCD	.....	Superuser Password	.....
Comm Port XON/XOFF (read-only)	.....		

Glossary

G

A

ABAM

A designation for 22 gauge, 110 ohm, plastic insulated, twisted pair Western Electric cable normally used in central offices**.**

AIS (Alarm Indication Signal)

An unframed sequence of All Ones normally sent by a DSU/CSU that cannot maintain the required pulse density in AMI mode or sent by a CSU that has a loss of signal condition on its data port. The signal is sent to maintain continuity of transmission and to notify the far-end that a transmission fault exists on the line. Same as Blue Alarm.

alternate loop code

Used to invert loop codes from U.S. standard code; inverts zeros to ones and ones to zeros.

AMI (Alternate Mark Inversion)

A line code in which the signal carrying the binary value alternates between positive and negative polarities.

ANSI (American National Standards Institute)

Coordinates the development of U.S. voluntary national standards in both the private and public sectors. Standards pertain to programming languages, EDI, telecommunications and physical properties of diskettes, cartridges and magnetic tapes.

ASCII (American National Standard Code)

The standard and predominant seven-bit (eight bits with parity) character code used for data communications and data processing.

G

asynchronous transmission

Transmission not related to a specific frequency, or to the timing of the transmission facility.

attenuation

Reduction or loss of signal strength, measured in decibels; opposite of gain.

B

B8ZS (Bipolar 8 Zero Substitution)

A technique used to accommodate the ones density requirements of T1 transmission.

bandwidth

The data-carrying capacity of a transmission medium, usually measured in Hertz (Hz), which equals cycles per second.

baud

A measurement of the signaling speed of a data transmission device.

BER

See bit error rate.

BES (Bursty Errored Seconds)

Occurs when a second has 320 or more CRC violations. (ESF format only)

bipolar

The predominant signaling method used for digital transmission services, such as DDS and T1, in which the signal carrying the binary value successively alternates between positive and negative polarities. Zero and one values are represented by the signal amplitude at either polarity, while no value "spaces" are at zero amplitude.

bit error

Occurs when the value of an encoded bit is changed in transmission, and interpreted incorrectly by the receiver.

Bit Error Rate (BER)

The percentage of received bits that are in error, relative to a specific amount of bits received; usually expressed as a number referenced to a power of 10.

bit/s

Bits per second; the basic unit of measure for serial data transmission capacity; Kbits (kilobits) for thousands of bits per second; Mbitps (megabits) for millions of bits per second, and Gbits (gigabits) for billions of bits per second.

Blue Alarm

An unframed sequence of All Ones normally sent by a DSU/CSU that cannot maintain the required pulse density in AMI mode or sent by a CSU that has a loss of signal condition on its data port. The signal is sent to maintain continuity of transmission and to notify the far-end that a transmission fault exists on the line. Same as Alarm Indication Signal (AIS).

broadband

Services or interfaces that operate above the T1 data rate, typically at NxT1, T3, SONET, or ATM speeds.

BPV (Bi Polar Violation)

Occurs when the ones bit is not represented with the opposite signal of the previous ones bit.

C

CCITT

International Telegraph and Telephone Consultative Committee.

central office (CO)

The phone company switching facility or center; usually a Class 5 end office, at which subscribers' local loops terminate.

channel

A physical or logical path allowing the transmission of information; the path connecting a data source and receiver.

circuit

Generally referring to a transmission medium connecting two or more electronic devices.

clear channel

A characteristic of a transmission path or digital circuit in which the full bandwidth is available to the user. The phone company does not use any portion of the bandwidth for framing or control bits.

clock

An oscillator-generated signal providing a timing reference for a transmission link; used to control timing functions such as sampling interval, signaling rate and duration of signal elements.

code conversion

The process of changing the bit grouping for a character in one code into the corresponding bit grouping for the character in another.

CMI (Control Mode Idle)

The process of changing the grouping for a character in one code into the corresponding bit grouping for the character in another.

communications port (Comm Port)

The electrical interface between a unit and the operator's terminal. Operator commands and responses can be communicated through the Comm Port.

connector

A physical interface, such as DB-15 or RS-232-C, typically with male or female components.

CPE (Customer Premises Equipment)

Equipment that interfaces the telephone network and physically resides at the user's location.

CRC (Cyclic Redundancy Check)

An error checking scheme used to check the received data. The CRC bits within the framing are calculated using the contents of the frame. The calculation is performed again when the frame is received and the CRC values are compared. If they do not match, the frame is considered bad and the CRC statistic is incremental. Performance checking is done by both the carrier and the customer without causing any interference with the T-1 traffic.

CSU (Channel Service Unit)

The CPE used to terminate a digital circuit at the customer site. The CSU performs certain line-conditioning functions, ensures network compliance to FCC rules and responds to loopback commands. It ensures proper ones density in the bit stream and performs bipolar violation correction. The DSU and CSU are often in the same unit.

CTS (Clear to Send)

A signal issued by the DSU to indicate it is connected to the digital network and is ready to accept data.

CV (Code Violation)

Any code violation.

D

D4

Framing format for T1 transmission that places 12 T1 frames into a superframe. In ESF (a newer framing format) frames consist of 24 bits instead of the previous standard 12 bits as in D4 format.

DACS (Digital Access Cross-Connect Switch)

A digital switching device for routing and switching T1 lines and DS-0 portions of lines among multiple T1 ports. DACS performs all the functions of a normal switch, except that connections are typically set up in advance of a call, not together with a call, as in most, normal low-bandwidth communications systems (e.g. voice-band voice and data). A DACS is in essence a manual T-1 switch.

data link

Any serial data communication transmission path, generally between two adjacent nodes or devices and without any intermediate switching nodes.

data link layer

In the OSI model, the network processing entity that establishes, maintains and releases data link connections between adjacent elements in the network.

DCE (Data Circuit-Terminating Equipment)

Equipment that is either a part of the network, an access point to the network, a network node, or equipment at which a network circuit terminates.

dial-up

Describing the process of, or the equipment or facilities involved in, establishing a temporary connection via the switched telephone network.

digital loopback

A technique for testing the digital processing circuitry of a communications device; may be initiated locally or remotely via a telecommunications circuit. The device being tested returns a received test message, the results of which are compared to the original message.

DS-0 (Digital Signal Level 0)

A 64kbit/s standard digital telecommunications signal or channel.

DS-1 (Digital Signal Level 1)

The 1.544Mbit/s digital signal carried on a T1 facility.

DS-3 (Digital Signal Level 3)

The 44.736Mbit/s digital signal carried on a T3 facility.

DSU/CSU (Data Service Unit/Channel Service Units)

The pair of communications devices that connect an in-house line to an external digital circuit. At the customer's end of the telephone connection, the DSU/CSU takes data from terminals and computers, encodes it, and transmits it down the link. At the receive end, another DSU/CSU equalizes the received signal, filters it, and decodes it for interpretation by the end-user.

DSU (Data Service Unit)

A device designed to connect a DTE to a digital phone line. The DSU transmits and receives the signal and provides buffering and flow control. The DSU and CSU are often in the same unit. Also called a Digital Service Unit.

DSR (Data Set Ready)

A data port signal.

DSU Loopback

A DSU loopback is intended to include as much of the customer data communications circuitry in the looped-back path as possible. The signal passes from the remote unit into the local unit as far as the DSU. This test loops the received network signal back to the network.

DSU/CSU (Data Service Unit/Channel Service Units)

The pair of communications devices that connect an in-house line to an external digital circuit. At the customer's end of the telephone connection, the DSU/CSU takes data from terminals and computers, encodes it, and transmits it down the link. At the receive end, another DSU/CSU equalizes the received signal, filters it, and decodes it for interpretation by the end-user.

DSX-1 (Digital Signal Cross Connect Level 1)

Parameters set used when DS-1 signals are cross connected.

DTE (Data Terminal Equipment)

Terminal equipment connected to the DSU and used for communication over digital networks. May be a terminal, computer, printer or multiplexer.

DTE loopback

An EIA-232-D signal which indicates that the DTE is ready for operation.

DTR (Data Terminal Ready)

Signal from DTE to DSU/CSU.

E

EER (Excessive Error Rate)

Determined by counting the number of T1/T3 code violations during a time interval.

EFS (Error Free Seconds)

Occurs when a second is free of CRC-6 violations or Out of Frame (OOF) events or one or more BPV or OOF events.

EIA (Electronic Industries Association)

An organization which sets data communication industry standards.

encoding/decoding

The process of reformatting information into a format suitable for transmission, and then recovering it after transmission.

equalization

The spacing and operation of amplifiers so that the gain provided by the amplifier, per transmission frequency, coincides with the signal loss at the same frequency; circuitry that compensates for the differences in attenuation at different frequencies.

ES (Errored Second)

Occurs when a second has one or more OOF events or CRC violations or with one or more BPV or OOF events.

ESF (Extended Superframe Format)

A new T1 framing standard used in Wide Area Networks (WANs). With this format 24 frames, instead of 12 are grouped together. ESF provides frame synchronization, cyclic redundancy checking and data link bits in overhead. It allows more information to be stored and retrieved easily, facilitating network performance monitoring and maintenance.

F

failed signal state

Occurs when ten consecutive severely errored seconds are detected.

far end

The unit or units remote from the user.

FE (Framing Errors)

Occurs when the end of a frame is not detected where it should be.

FDL (Facility Data Link)

A four Kbps data channel provided by 12 of the 24 ESF framing bits. It is used by the carrier to request reports, clear error counters and activate loop backs.

FG (Frame Ground)

A signal from DTE to DSU/CSU.

fractional bandwidth DTE loopback

A loopback test that loops back the signal at the network interface. See also **loopback.**

Fractional T1

A service that provides less than full T1 capacity (one or more 64 Kbps channels are provided).

frame

A group of bits sent serially over a communications channel. The basic data transmission unit employed with bit oriented protocols.

frame relay

A high-speed packet switching protocol used for wide area networks (WANs); faster than traditional X.25 networks, because it was designed for today's reliable circuits and performs less rigorous error detection. Frame relay networks use bandwidth only when there is traffic to send. Frame relay does not support voice.

framing

A technique which separates incoming bits into identifiable groups to enable the receiving device to recognize and reconstruct them.

frame ground

A metallic layer acting as a shield, consisting of tape, braid, wire or sheath and surrounding insulated conductors in cable. It may be the metallic sheath of the cable or the metallic layer inside a nonmetallic sheath. It reduces stray electrical fields, prevents outside electrical interference, drains off current induced by lightning and provides for safety of personnel.

frequency

The number of repetitions per unit time of a complete waveform. The number of complete cycles per unit of time, usually expressed in Hz.

full bandwidth DTE loopback

A loopback test that loops back the signal at the multiplexer. See also **loopback.**

H

HDLC (High Level Data Link Control)

Bit-oriented, data-link control protocol; any related control of data links by specified series of bits, rather than by control characters.

I

IP address

A unique, 32-bit identifier for a TCP/IP host on a network. IP addresses are normally printed in dotted decimal form, such as

L

LBO (Line Build Out)

An adjustable value used to tune the attenuation between the DSU/CSU card and the last repeater on the T1 circuit.

LED (Light emitting diode)

A device that accepts electrical signals and converts the energy to a light signal.

LOF (Loss of Frame)

Occurs when a received digital signal loses frame synchronization.

LOFC (Loss of Frame Count)

A count of declared Loss of Frame events (ESF framing only).

loopback

A diagnostic test in which the transmitted signal is returned to the sending device after passing through a data communications link or network. This allows a technician (or built-in diagnostic circuit) to compare the returned signal with the transmitted signal and get some sense of what's wrong.

LOS (Loss of Signal)

Occurs when an input signal is detected as all zeros for 176 bit times.

loss

A reduction in signal strength, expressed in decibels.

LSC (Loopback Select Code)

An indicator describing a DSU loopback characteristic. LSC is a minimum of 35 LSC bytes of S11101F1 with secondary channel.

LT (Local Test)

A data port signal to DSU/CSU.

M

mask

Refer to subnet mask.

MIB (Management Information Base)

A structure that defines what is obtainable from a network device and what can be controlled. It has a directory listing the logical names of all information resources residing in the network and pertinent to the network's management. It is used to describe network management variables.

multiplexer

Any device that allows two or more users to share a common physical transmission medium. Employed in pairs, where each device performs both multiplexing of the multiple user inputs and demultiplexing of the channel back into the separate user data streams.

multiplexing

The combining of multiple data channels onto a single transmission medium. Typically, data streams are interleaved on a bit or byte basis (time division) or separated by different carrier frequencies (frequency division).

multidrop

A communications arrangement where multiple devices share a common transmission channel, though only one may transmit at a time.

N

NEBS

A network Equipment Building Systems requirement. A standard issued by Bellcore that spells out central office standards for grounding, cabling and power.

network

An interconnection of computer systems, terminals, or data communications facilities.

NI (Network Interface)

The point of demarcation between the customer premises and the carrier's network, usually drawn at the network connector on the rear panel of the Digital Link access device.

NRZ (Non-Return to Zero)

A binary encoding and transmission scheme where “ones” and “zeros” are represented by opposite, and alternating, high and low voltages.

NRZI (Non-Return to Zero Inverted)

A binary encoding technique that inverts the signal on a “one” and leaves the signal unchanged for a “zero,” where a change in voltage state signals a “one” bit and the absence of a change denotes a “zero” bit value.

O

OOS (Out of Service)

A digital network trouble signal.

OOF (Out of Frame)

An error checking scheme. An OOF occurs when two out of four consecutive framing bits are in error.

P

parity bit

An additional, non-informational bit appended to a group of bits indicating that the number of “ones” in the bits group is odd or even.

parity check

A process of error checking using the parity bit.

polarity

Any condition where there are two opposing charges, such as positive and negative.

port

The physical point of access into a computer, network or other electronic device.

protocol

A formal set of rules governing the format, timing, sequencing and error control of exchanged messages on a data network.

R

RD (Receive Data)

A data port signal.

receiver

The receiver synchronizes the framing pattern, separates the frame bits from the payload data and monitors for frame errors in 64K mode. It achieves frame synchronization within 5msec (ANSI T1.410-1992 Section 8.2).

repeater

Equipment that receives a pulse train, amplifies it, retimes it, and then reconstructs the signal for retransmission.

return to zero

Method of transmitting binary information such that, after each encode bit, voltage returns to the zero level.

RI (Ring Indicator)

A data port signal.

RJ-48S

An 8-position keyed jack used to connect services that are covered under FCC Part 68 Rules, such as public switched digital service (PSDS), switched 56, 19.2 Kbps service, 64 Kbps service, and synchronous digital data with secondary channel.

RLSD

Receive Line Signal Detect, a data port signal

RS-232

A TIA/EIA standard for serial transmission.

RS-232-C

An EIA specified physical interface, with associated electrical signaling, between data circuit terminating equipment (DCE) and data terminating equipment (DTE).

RS-449

A common 37-position interface for data terminal equipment and data circuit terminating equipment employing serial binary data interchange. It is a balanced interface, based on unipolar digital signals, depending more on current flow than voltage, therefore supports greater distances than the RS-232 interface.

RTS (Request to Send)

A signal sent by DTE to DSU/CSU indicating DTE has data ready to transmit.

S

SCR (Serial Clock Receive)

A unipolar clock from the DCE signal. A data port signal.

SCT (Serial Clock Transmit)

A unipolar clock from the DCE signal. A data port signal.

SCTE (Serial Clock Transmit External)

The clock signal is echoed from the DTE for the purpose of timing incoming data on long cable runs.

scrambler

A device or software program that encodes data for encryption. It distorts a voice or data conversation so that only another like device can figure out the content of the message.

SD (Send Data)

A signal from DTE to DSU/CSU.

secondary channel

A subchannel derived from the main channel. It does not carry data messages and is used for diagnostic or supervisory purposes.

serial transmission

A sequential transmission of bits constituting an entity of data over a data circuit.

SES (Severely Errored Second)

A second during which 320 or more CRC violations or OOF events have occurred (ESF framing only).

SG (Signal Ground)

A signal from DTE to DSU/CSU.

simplex current

One way transmission used by Telco to provide power to repeaters.

SLIP (Serial Line IP)

A TCP/IP protocol that allows IP packets to be transmitted over a serial link, such as a dial-up or private telephone line.

SMDS (Switched Multimegabit Data Service)

A fast-packet technology based on the connection-less data networking capability described in the IEEE 802.6 specification. The data format for SMDS is "cell oriented." SMDS does not support voice.

SNMP (Simple Network Management Protocol)

A widely-used network monitoring and control protocol. Data is passed from SNMP agents (hardware and/or software processes reporting activity in each network device, hub, router, bridge, etc.) to the workstation console used to oversee the network. The agents return information contained in a MIB (Management Information Base), which is a structure that defines what is obtainable from the device and what can be controlled.

stop bit

The last transmitted element in each character, which permits the receiver to come to an idle condition before accepting another character.

subnet mask

The number of bits in an IP address used for the subnet address.

synchronous transmission

Data communications in which characters or bits are sent at a fixed rate and the transmitting and receiving devices are synchronized.

T

T1

A digital carrier facility used to transmit a DS-1 formatted digital signal at 1.544 Mbit/s. T-1 normally can handle 24 voice conversations, each one digitized at 64kbps. But, with more advanced digital voice encoding techniques, it can handle more voice channels. T-1 is a standard for digital transmission in North America. T-1 lines are used for connecting networks across remote distances.

T3

A digital carrier facility used to transmit a DS-3 formatted digital signal at 44.736 Mbit/s.

T-Carrier

A time-division, multiplexed digital transmission facility, usually operating at an aggregate data rate of 1.544 Mbit/s.

telnet

A remote terminal application that enables the user to log on to a remote computer on the same IP network. The user can work from the PC as if it were a terminal attached by a hard-wired line to the remote computer. The application uses the *Telnet* Internet protocol.

transmitter

In 64K mode, the transmitter inserts the frame bit, with a fixed pattern of 101100.

TRAP

A mechanism by which a device automatically sends an alarm for certain network events to a management station. The management station can initiate a polling sequence to the device to determine the cause of the problem.

U

UAS (Unavailable Seconds)

Number of seconds elapsed after 10 consecutive SES events are received (ESF framing only).

V

V.35

A CCITT standard for the trunk interface between a network access device and a packet network. It defines signaling for data rates greater than 19.2 Kbps.

V.52

Terminal emulation standard. CCITT standard (1976) for various loopback tests that can be incorporated into modems for testing the telephone circuit and isolating transmission problems. Operating modes include local and remote digital loopback and local and remote analog loopback.

V.54

A CCITT standard for loop test devices in modems. It defines local and remote loopbacks.

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